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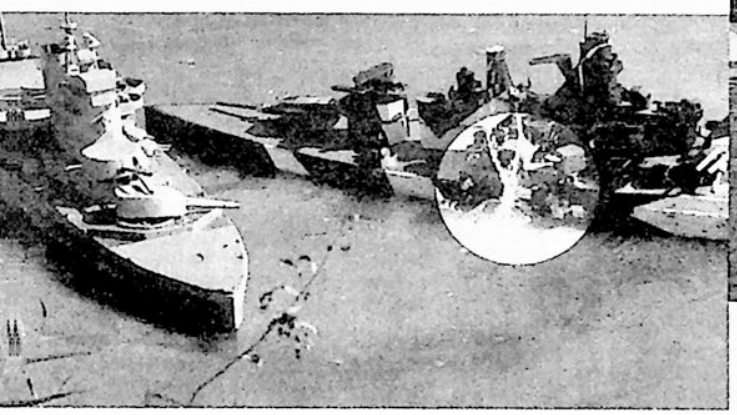

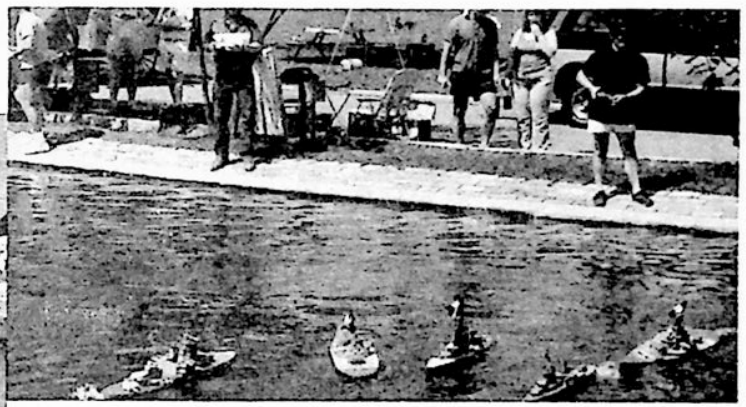

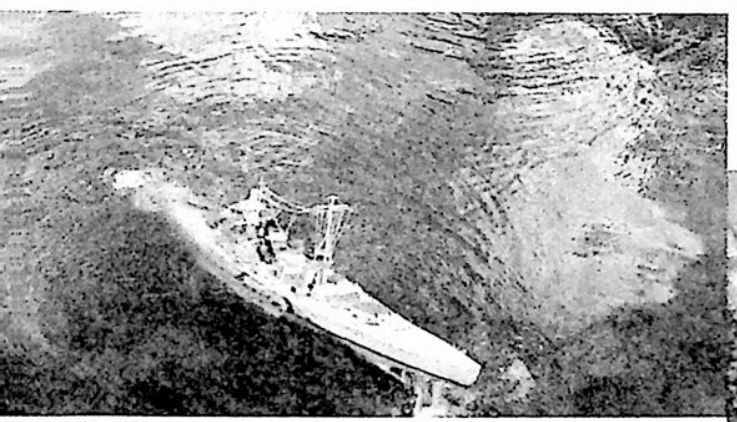

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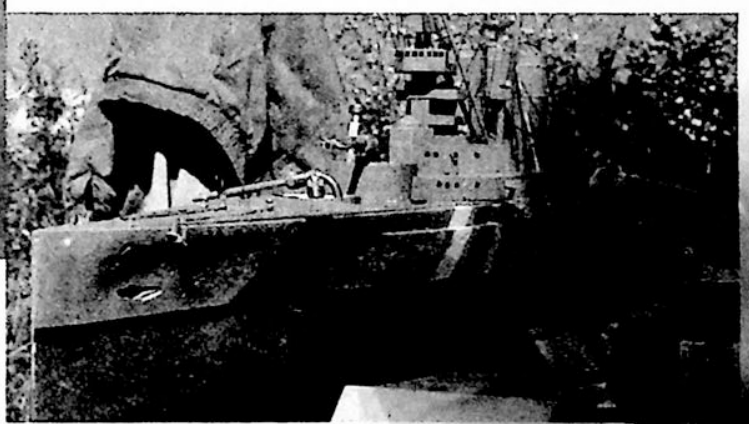

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FALL 1991
VOLUME 4, NUMBER 16

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714/ 645-8830

COVER: The waist section of the "HMS Royal Caroline" is an intricately detailed model, featured on page 42. Photo by Scottie Dayton. Top inset is one of Francis Reynolds' experimental "hydrocopters", featured on page 34, and bottom inset is the Robbe "Unlimited" featured in David Frank's review on page 52.

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PUBLISHER
Anita Northrop

EDITOR
Wm. C. Northrop, Jr.

GENERAL MANAGER
A. Valcarsel

ASSISTANT GENERAL MANAGER
Dawn Johnson

MANAGING EDITOR
Richard Dowdy

ART DIRECTOR
Scott A. McPherson

WORD PROCESSING
Edna Clark

DRAWINGS BY
Al Novotnik

ACCOUNTING MANAGER
Robert Ruiz

OFFICE STAFF
Louis Garcia
Alexandre Nguyen
Betty Simpson
Theujuaninie (T) Wallace

CONTRIBUTING EDITORS

Rod Carr	Eloy Marez
Jerry Dunlap	Peter Shreeves
David Frank	Ralph Warner

ADVERTISING
Anita Northrop

(714) 645-8830

US BOAT & SHIP MODELER (ISSN 0899 496X) is published quarterly by RCMB INC., 898 W. 16th St., Newport Beach, California 92663. Phone (714) 645-8830. Subscriptions: $13.95 per year, $26.75 for two years. Single copies $4.50. Subscriptions outside the US (except APO & FPO) $23.00 for one year. All payments must be in US funds, drawn on a US bank.

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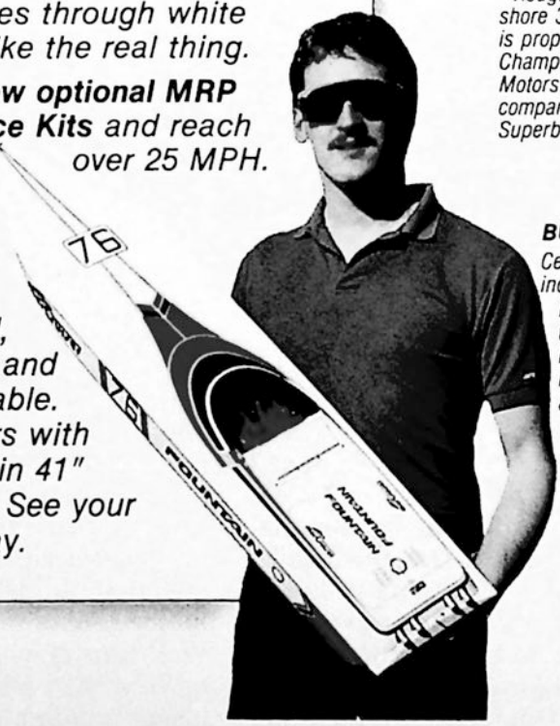

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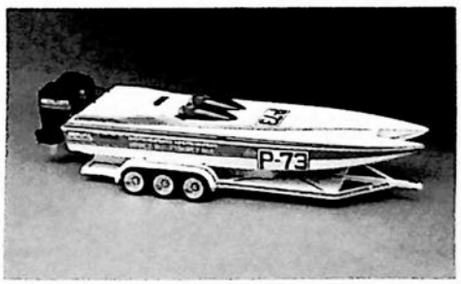

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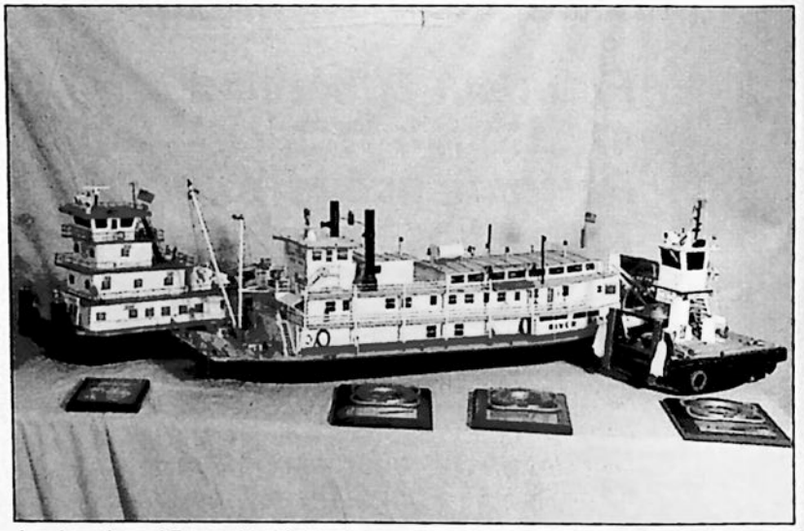
CAP'N'S LOG

BY BILL NORTHROP

WHO, WHAT, WHERE?

Three questions that often come to mind, particularly in the thoughts of a model boat and ship magazine publisher, have to do with determining who reads the magazine, what kinds of articles are of most interest, and where the heck are all those modelers hiding out?

Bill Zumwalt and some of his towboats. See text.



Another view of Zumwalt's highly detailed towboats.

The casual observer is only aware of model boaters who appear at the same body of water where the C.O. (casual observer) happens to fish, swim, indulge in some form of full-scale boating and/or water sport, or is simply nothing more than . . . a casual observer, merely out for a walk in the fresh air. What the C.O. sees is a person occupied with a model boat. Most often, the "model" is in the toy category, either sail or electric power. Only a few years ago, this toy would have been free sailing. However, nowadays, even these boats may be under some sort of simple, limited radio control . . . but still toys; buy 'em at the department store, stuff in some batteries, and stick 'em in the water!

Whether or not it is fully appreciated, our casual observer may stumble onto a true model boat activity; RC sailing yachts, electric or gas-powered RC monos and/or hydros, or carefully detailed scale boats or ships that can be maneuvered in realistic fashion by radio control. And of course, the ultimate (in our minds as modelers), would be the C.O.'s presence at an organized race or scale regatta with a knowledgeable announcer on the PA to explain what's going on.

Of what the good old casual observer is *not* aware, and those of us in the model publishing and manufacturing industries can only try to make calculated guesses about, are the uncounted numbers of "closeted" modelers. "Garaged" or "basemented," depending on the geographical location, might be more explicit than "closeted." These folks aren't purposely in hiding. The majority are active modelers who are in the hobby for their "own amazement." They build and operate their models (or statically display them at home) as a self-challenge to their own abilities, and they are just as proud of their accomplishment as the person who prefers to compete with others, statically and/or operationally, and bring home a trophy. And believe me, these non-competitors are the great silent majority!

It can happen in physical sports, too. Obviously, team sports don't qualify. However, golf is a prime example of a sport that is self-challenging enough that you never have to take on an opponent in order to feel dismay or delight at your ability!

We'd like to know our readers' opinions about the "silent majority" out there. Are they mostly operational model boaters? Are they mostly static ship model builders? Are they so silent they won't tell us? What do you think?

PICTURES, PICTURES, PICTURES.

It's pretty obvious that the recent winter and early spring months have been well spent by model boaters. Lot's of very nice models have been built, and luckily, some of the builders are also good photographers, or have friends who know how to point a camera. Caption space doesn't always provide enough room for proper description of a nice piece of model building, so you'll probably notice a lot of reference to "see text." Well, this is where you'll see it!

We've had a surprising (to me, at least) amount of interest in radio controlled towboats since first publishing photos of one of Bill Zumwalt's models with tows of at least a half-

dozen barges. Many have asked how many barges can be handled by one towboat, and some also want to know if any kind of record has been established. We've corresponded and talked with Bill on the phone, and part of the results of these communications will be the production of a few articles on the subject. Meanwhile, if you want to contact Bill Zumwalt, he'd be delighted to hear from interested parties. His address is Rt. 1, Box 610, New Florence, MO 63363, and his phone number is (314) 835-3158. As for how many barges can be handled, Bill points out that the limiting factor may simply be, "How many three to four-foot barges can you build, store, and transport to the water in one trip?"

We have two photos from Bill in this issue. One shows the man himself, with four of his scratch-built replicas (l to r); "Carl J.," a truckable (yep, just what it says) general purpose boat at half-inch scale, the "Marvin E. Norman" at quarter-inch scale, the "Thomas K." his largest replica so far, and the "Sierra Dawn" which is his first replica, and the one that has handled the largest tow. The other photo shows Bill's "River King," a generic steampusher, flanked by the "Carl J." and the "Marvin E. Norman."

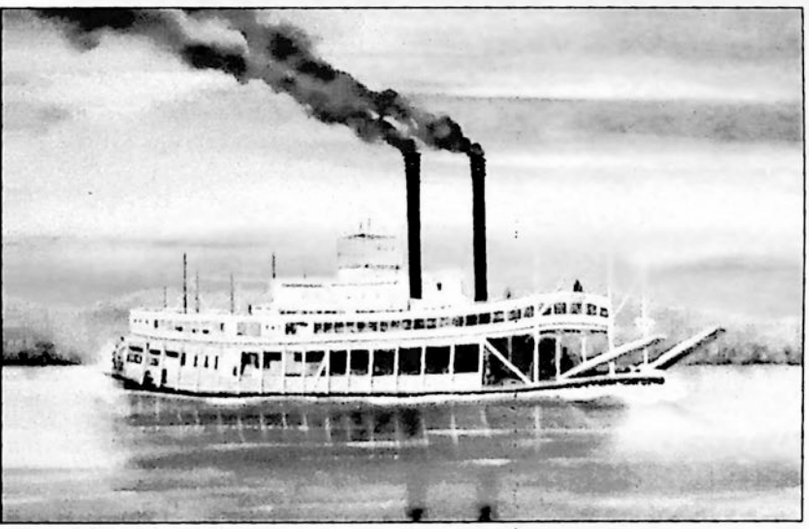
Next we have a photo of the latest water color painting of a sternwheeler by Gustave Nepper, of Cincinnati, Ohio, one of a series he has completed for a local (to Cincinnati) art exhibit. The project has triggered Gustave's interest in building a sternwheeler model. We provided him the address of sternwheeler plans specialist John Fryant. Nepper's 30 years of model aircraft building should qualify him for the job!

Ron Seiler, Niles, Illinois, Director of Advertising for Sportmart Inc., sends us a photo of his lobster boat constructed from a Midwest Products Co. kit. Ron added some extra features, such as an operating anchor that raises and lowers, an AM/FM (!) radio, motor sound, complete running and cabin lights, and the steering wheel is linked to, and is synchronized with the movement of the rudder. How about that!

Ask and ye shall receive! In our Winter 1990 issue, we published a photo of Roland Schaefer's fishing trawler (Jersey Dragger construction article in Fall 1990 issue) and hinted that we couldn't see the seagull perched on the forward companionway of his model. Roland promptly moved in closer with his camera and set the record straight! Note the clarity of detail and the shadowless, even lighting of the photo. It's excellent, and every magazine publisher's dream of a very useable photo! Roland thoughtfully included info on his technique, so listen up, camera fans! He used a Minolta XG7, 50mm lens (standard lens with most 35's) set at f11, a Plus 2 close-up lens, and Fujicolor ASA 400 film. The real key to the quality of the photo, however, was the use of a diffuser on the auto flash unit. This knocks out the harsh shadows and more evenly distributes the light. Roland is from Milwaukee, Wisconsin, and is now vice president of the Wisconsin Scale Boating Association. Paul Littel, of Greendale, WI, is the new president.

Bob Klubertanz, Holmen, Wisconsin, sends us an in-progress photo of his 3/4-inch scale model of a ports and waterways boat as operated by the Coast Guard. Working from hull drawings obtained from the Coast Guard Museum in Seattle, Washington, and photos of real boats being used in Boston, Massachusetts and Tacoma, Washington, Bob will have completed the model and entered it in the Newport News exhibition in Virginia by the time you read this. Hopefully we'll see a photo of the completed vessel, along side its trophy, in a future issue!

There are probably enough Hartman Fiberglass RC harbor tugs around to form an association, and a carefully detailed and painted version of it never fails to provide an excellent subject for the camera.



Sternwheeler painting by Gustave Nepper.

Roland Schaefer's seagull. See text.

Lobster boat from Midwest kit, by Ron Seiler. See text.

Dr. Dolinsky's Hartman Fiberglass tug and dock. See text.

Herbert Dolinsky, a dentist from Jersey City, New Jersey, went over and above the call of duty by not only doing an exceptionally fine job on the tug, but also building an outstanding dock for the boat. (What's an Amoco tug doing tied up at an Esso dock, Herb?) The dock separates into three pieces, and is fully electrified. The tug is equipped with a diesel engine/horn sound system, smoke, operating radar antenna, searchlights, running lights, mast lights, cabin light, emergency strobe, and a visible crew of nine. We can bet that fellow modelers would like more information on the construction of the dock. Can we set up an appointment, Doctor?

Our mahogany scale boat specialist from Mercer Island, Washington, Gary Griswold, has come up with another gem. This one, the "Baby Bootlegger," won the Gold Cup in 1924 and 1925, at a speed of 46.6 mph. The model is 36 inches long, and is powered by an electric motor. It is not planked, but skinned in 1/32-inch mahogany with medium weight Sig fiberglass cloth and two coats of resin, followed by a final spray coat of epoxy clear.

Craig Newquist, of Moline, Illinois, did some fancy things with his 40-inch Prather Deep V. Most obvious is the addition of a wing, which Craig designed and built. Craig also fabricated a watercooling head, intake manifold, exhaust header for the 22cc McCulloch weedeater engine, and added a Peco carburetor. The engine also features a tuned pipe and a flex coupler adaptor to the clutch and water pump. It runs on 25% nitromethane fuel. The paint scheme is metalflake blue with gold metalflake overlay and neon pink accent.

We close our "see text" picture caption department with photos from Daniel Christopher, President of Chris-Prod Industries, Wakefield, Massachusetts, who advertises the "Aqua-Rama" in this magazine. We'll let him tell you about them in his own words.

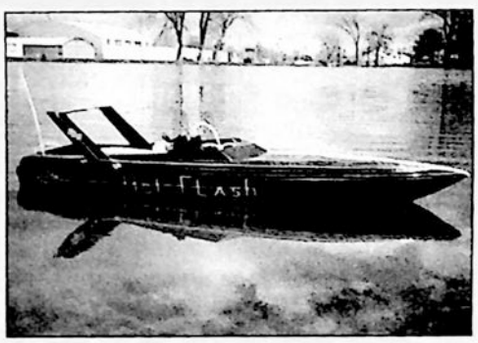
"This model of the `African Queen' was built as a birthday gift for the builder's mother. A rough plan was compiled by studying a video tape of the film, *The African Queen*, and also studying photos included in Katherine Hepburn's book about the making of that film.

"The model utilizes poster board hull construction to simulate the plate hull of the actual boat. The 1/25 scale plastic figures were modified to produce the 'Rosie' and 'Mr. Alnutt' characters.

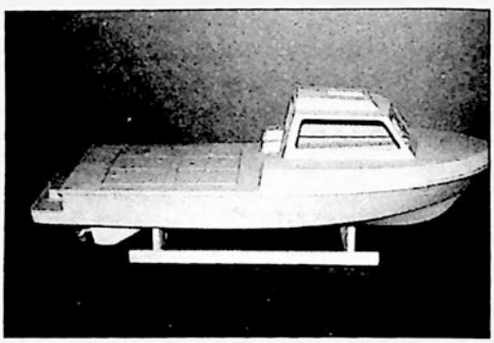
"The model features all deck clutters and other items shown in the film. Just a few items noticeable in the photos are such things as the cases of blasting gelatin, that finicky old steam engine complete with the dents from being kicked, pile of fire wood, oxygen/nitrogen cylinders, and various other clutter. The model is also realistically weathered, to depict the characteristic wear and tear of the 'African Queen.'

"The model is 13.5 inches long. This model was presented as a gift to my mother, along with a copy of Katherine Hepburn's book, *The African Queen* is my mom's favorite film!"

The "Baby Bootlegger," twice winner of the Gold Cup! See text.



Craig Newquist's modified Prather Deep V 40.



Ports and Waterways Coast Guard boat, under construction by Bob Klubertanz.

THINGS TO DO

First of all, we would like to caution all of our readers that because of our publication production lead time, plus the fact that we only publish quarterly, it is necessary that any listings of scheduled activities must reach us as much as five to six months ahead of the event. As an example, we received notice of a major regional meet on the east coast that was scheduled for July 21, 1991. The information was mailed to us on April 1, soon after the Summer issue had gone to press, which meant the earliest we could publish the event was in this, the Fall issue. Unfortunately, this issue will not hit the newsstands until the end of July, too late to tell our readers about it!

• • •

Though it will be too late to preregister for the contest by the time you read this, you may still want to enter and/or attend the Manitowoc Maritime Museum's 15th Annual Model Ships and Boats Contest, and the Model Ship Builder Symposium on August 17, 1991, at the Maritime Museum, 75 Maritime Drive, Manitowoc, Wisconsin 54220. Actually, the symposium and dinner will be at the Inn On Maritime Bay, next to the museum. Models will be accepted for the competition beginning August 10, and entries will close on August 17. Further information on the event may be obtained by contacting the museum curator, Isacco Valli.

• • •

The Diablo Model Boat Club, c/o Barry A. Roth, Commander, P.O. Box 30114, Walnut Creek, CA 94598, will be holding the third of three summer radio control model boat regattas on October 5. The regattas take place at the upper lake of Heather Farms Park, North San Carlos Drive, Walnut Creek (about 40 miles east of San Francisco. The three events are; Steering and Conning for Scale Electric and Steam, Fast Electric Racing, and Sailboat Racing. For more info, contact Barry at the above address, or call (415) 935-9309, evenings, Pacific time.

• • •

The Marine Modelers Club of New England, members of the Scale Ship Modeler's Association (SSMA), will host the second annual SSMA New England Scale Regional Regatta. The event will be held on August 17 (rain date 18th), 1991, at the Rocky Woods Reservation, Route 109, Medfield, Massachusetts. Events will include precision steering and scale judging. For more info, contact Dean Jernstrom, 838 Pond Street, Franklin, MA 02038.

• • •

The second of two IMPBA races this year is being sponsored by the Southern Tier New York R/C Boat Club on August 25 and 26, 1991. For more info, contact Lew Van Duzer, Sec., 913 West Broad St., Horseheads, NY 14845.

• • •

The 14th Annual Golden Gate Model Concourse, sponsored by the San Francisco Model Yacht Club, will take place at Spreckles Lake, in Golden Gate Park, on September 7 and 8, 1991. There will be two divisions; Radio Controlled (if entered in maneuver contest) and Static. The RC Division will be divided into; Pleasure, Fishing, Tug, Military, and Commercial. Judging will be based on overall appearance and maneuverability. Static will be divided into Power and Sail, and judging will be based on overall appearance. For further info, call Lee Duvall between 10 AM and 2 PM Pacific at (415) 785-3195, or Ken Valk between 6 PM and 8 PM Pacific at (415) 755-2325.

• • •

The Great Lakes Model Boat Association, of Ontario, Canada, will have a Model Exhibition on September 27 and 28, 1991, hosted by the Metro Marine Modellers and Harbourfront, in Toronto, at Queens Quay. The three classes to be judged will be Sail, Naval, and Working, with each subdivided into kit, semi-kit, and scratch-built. There will also be running events on the pond at Harbourfront. For further info, contact Bob Farrant at (416) 270-0874, or at 2211 Sherobee Road, Unit 1909, Mississaugua, Ontario L5A 2H5. There is no restriction on entry. Come one, come all.

The Great Lakes Maritime Institute will hold its seventh model ship contest and show at the Dossin Great Lakes Museum on October 12 through 19, 1991. Plaques will be awarded for "Best of Show" and "Best of Show - Great Lakes."

While all types of ships are welcome, the institute particularly encourages model builders in the Great Lakes region to take advantage of plans, photos, and other materials which are available from marine museums in the region to construct models of Great Lakes vessels. For further information and details, write to: Houghton Smith, Contest Chairman, c/o Dossin Great Lakes Museum, Belle Isle, Detroit, MI 48207.

• • •

The Nautical Research Guild (NRG) will be holding its 18th Annual Conference, October 25 to 27, 1991, at the Holiday Inn, Coliseum, Hampton, Virginia. In addition to the technical and business meetings, there will be interesting special activities, including a four-hour harbor cruise of Hampton Roads, that will take in views of the S.S. United States, the U.S.S. Enterprise, and the U.S.S. George Washington, plus the Naval Base, where military vessels from the Persian Gulf have recently returned. There will also be side trips to Colonial Williamsburg and the Pottery, for those not attending the technical sessions. A banquet and awards presentation will also take place on Saturday, concluding the Mariner's Museum Model Contest. A sale and swap show is scheduled for Sunday, and the Mariner's Museum will be open free to all attendees throughout the weekend and on the following Monday. Much more detailed information on the annual conference is available by contacting William H. Clarke, Meet Chairman, 196 Odd Road, Poquoson, VA 23662, phone (804) 868-6809.

THISA AND THATTA

Readers interested in the *1901 Album of Designs for Boats, Launches, and Yachts*, reviewed in our Summer '91 issue, are to be informed that said book can no longer be obtained from Altair Publishing Co. However, this item is now available from Renquist Associates, attention Judy Renquist, 2300 Washington Ave., Racine, WI 53405.

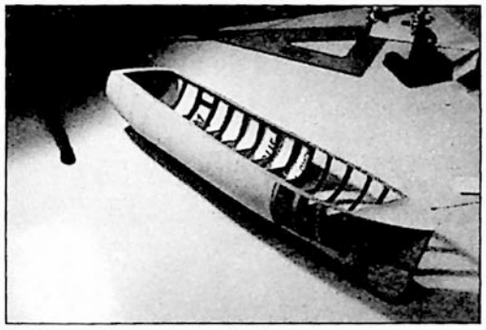
• • •

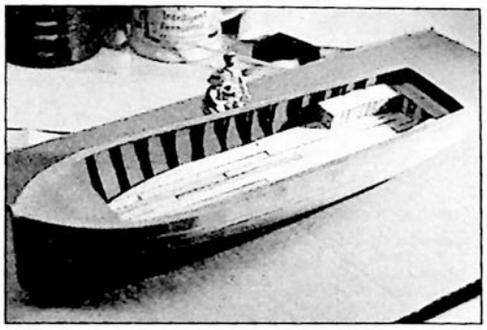
Jerry Dunlap writes quite a few articles for *USB&SM*, but not as many as you were lead to believe in the Spring '91 issue! First, his name appeared as the writer of the Book Review on page 14, which of course, should have been credited to one of our regular book reviewers, Peter Shreeves. Then his name again appeared on page 57 as the author of the article "Fri - A Versatile Traditional Ketch," which was actually written and submitted by John Heinz.

The explanation (excuse?) for these strange happenings cannot be fully clarified . . . not even by those of us who faithfully plod through pages of edited material, looking for just such booboos. It all has something to do with not being able to see the tree for the woods, and/or some sneaky little gremlins who are just waiting around for the opportunity to catch you off guard.

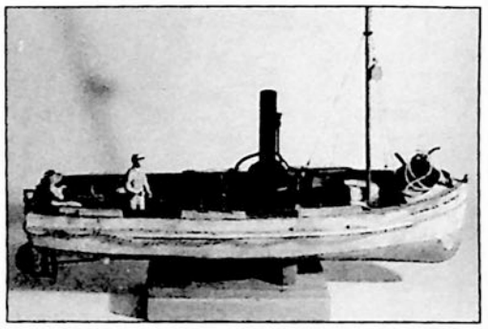
• • •

Reader Jack Demyan, of Glen Burnie, MD, brought forth a worthwhile observation regarding the article by Tom Jass on the RC combat ship, the "HMS Sheffield." Tom, in the second installment, commented that, "Holding the poppet valve open after the first BB is expelled merely results in venting freon through the gun barrel . . . "It is now pretty well known that freon gas contributes to the deterioration of the ozone layer above our atmosphere. Fortunately, this particular act mentioned by Tom is extremely rare, however, every little bit adds up to a lot. As you will note if you read John White's article on combat in this issue, he points out that all of the west coast clubs have already recognized this potential hazard and have ruled against the use of freon as a BB propellant. •



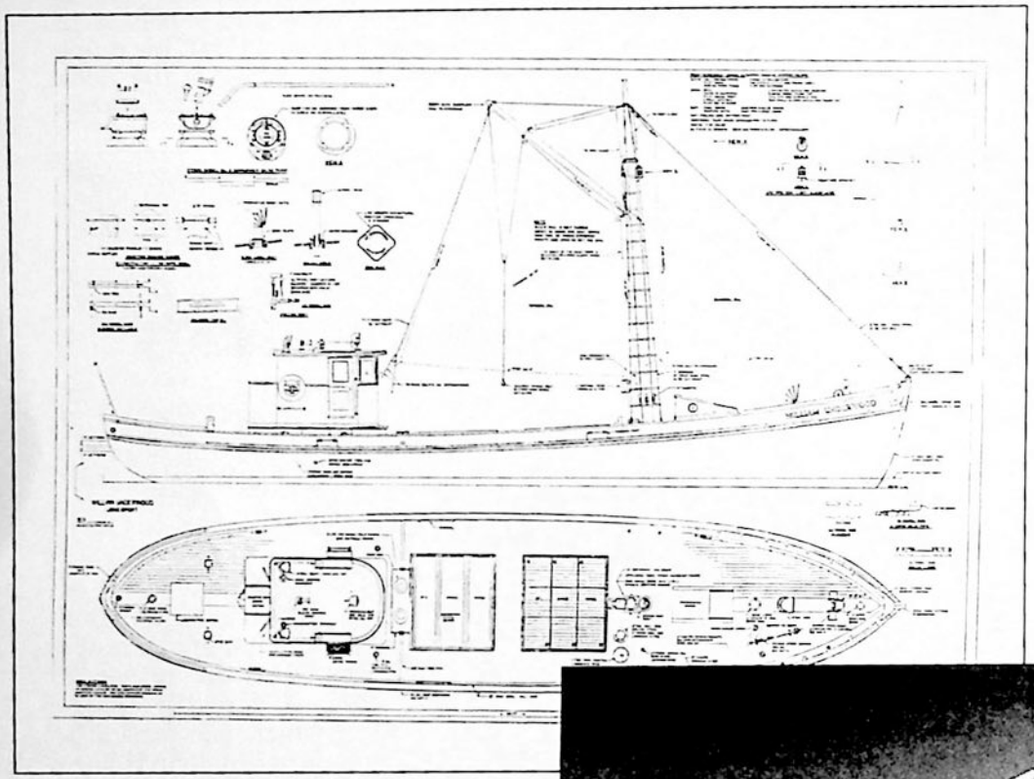


(Above and right) The "African Queen" under construction. See text.

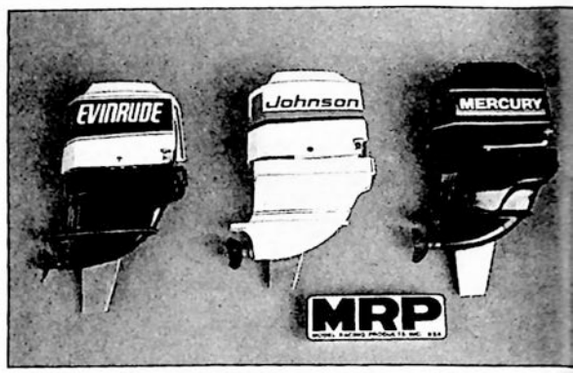


Daniel Christopher's completed "African Queen."

SHIP'S STORE

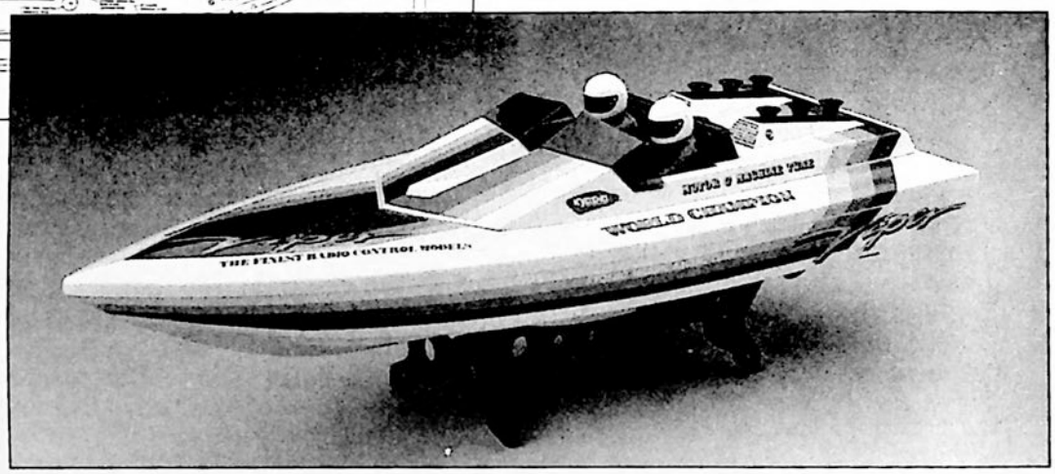


"Wm. Underwood" Maine sardine carrier plans from Taubman Plans Service.



Electric outboard from MRP.

Kyosho "Viper" from Great Planes Model Distributors.



Two great new boat plans are being offered by Taubman Plans Service, 11 College Drive, Box 4G, Jersey City, NJ 07305, phone (201) 435-5205. One is particularly attractive to RC scale boat modelers, as the plans are drawn to a scale that produces a 46-inch model without enlarging or reduction of parts.

All material published in *SHIP'S STORE* is quoted or paraphrased from press releases, furnished by the manufacturer and/or their advertising agencies, unless otherwise specified. The review and/or description of any product by *USB&SM* does not constitute an endorsement of that product, nor any any assurance as to its safety or performance.

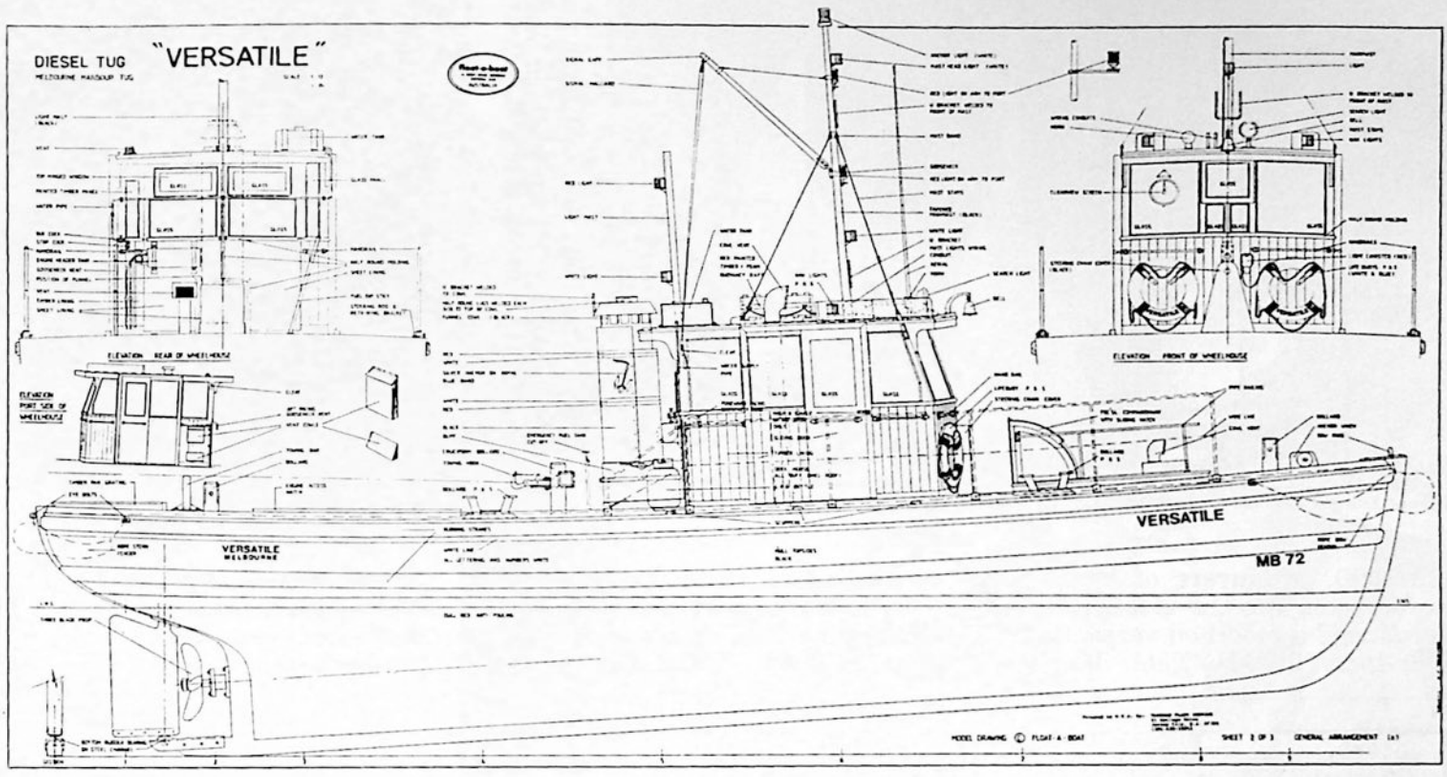
First is the "Wm. Underwood," a 70-1/2 foot Maine sardine carrier, drawn by Arthur Herrick to 1:32 (3/8"=1') scale for Dynamite Payson (No, he's not a boxer, he's a designer and builder of small boats, and is particularly well known in the New England area, especially in Maine. He's also a ship modeler, and has authored a book entitled "Boat Modeling with Dynamite Payson"). The plan set of six 24-1/2 x 30-1/2 inch sheets sells for $35.00 plus 15% for shipping.

The second offering is a 46-foot Melbourne, Australia diesel-powered harbor tug named the "Versatile." It is drawn to a 1:12 (1"=1') scale and is on three 27-1/2 x 48-1/2 inch sheets by well-known RC sailing yacht designer Adrian Brewer. The set sells for $30.00 plus 15% for shipping.

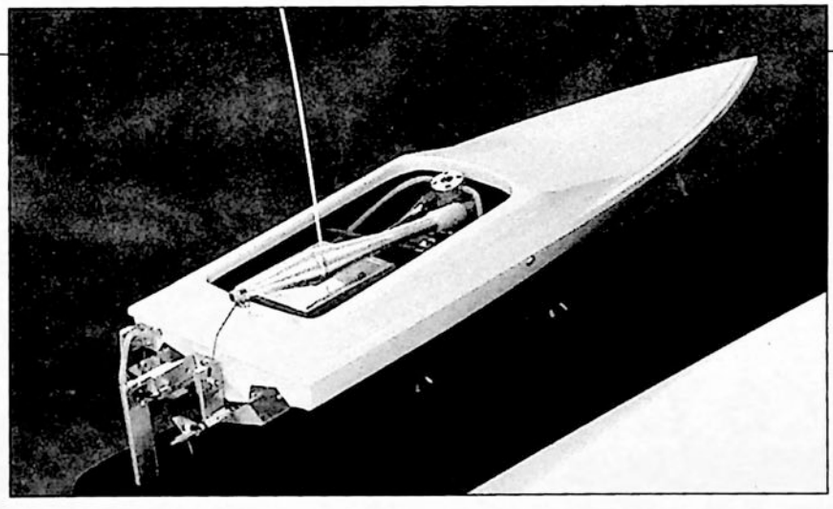
Both plan sets are cleanly and neatly drawn. When you contact Abe Taubman, be sure to mention that you read about his plans in *U.S. Boat & Ship Modeler*.

• • •

The Kyosho "Viper" is an affordable, high-performance semi-vee that comes 70-percent pre-built. Compact and lightweight (length 25 inches, beam 8-1/2 inches, 2-3/4 pounds), it can be run in tighter areas than larger RC boats, yet offers stable handling qualities. The direct drive system comes with a LeMans 360 ST motor, prop, and speed control. Pilot figures, smoked windshield, exhaust stacks and colorful trim decals give it sharp looks. Suggested retail price is $149.95. Available through Great Planes Model Distributors, 1608



"Versatile" diesel tug boat plans from Taubman Plans Service.



Husselcraft 3.5 Mono by West Side Racing.

Interstate Drive, Champaign, IL 61820.

• • •

MRP (Model Racing Products), 18676 142nd Ave., N.E., Woodinville, WA 98072, now sells its record holding electric outboard separately. This is the same motor that won the APBA championship, driving MRP's "Bud Light" tunnel boat. It features a high speed surfacing propeller, strong (corrosion resistant) stainless steel, brass, and aluminum components, and comes with the buyer's choice of Evinrude, Johnson, and Mercury decals. The list price is $99.95.

• • •

West Side Racing Products, Inc., P.O. Box 2483, Livonia, MI 48151, phone (313) 532-7967, introduces the ready-to-run or race version of the Husselcraft 3.5 Mono. This boat features a fiberglass hull, and comes equipped with a 3.5 OPS marine engine linked to the West Side Racing square drive system. It is available with or without radio. The only additional material needed is fuel, starting equipment, and open water! For more information on this and other West Side Marine products, contact Paul Senia, and be sure to tell him we sent you!

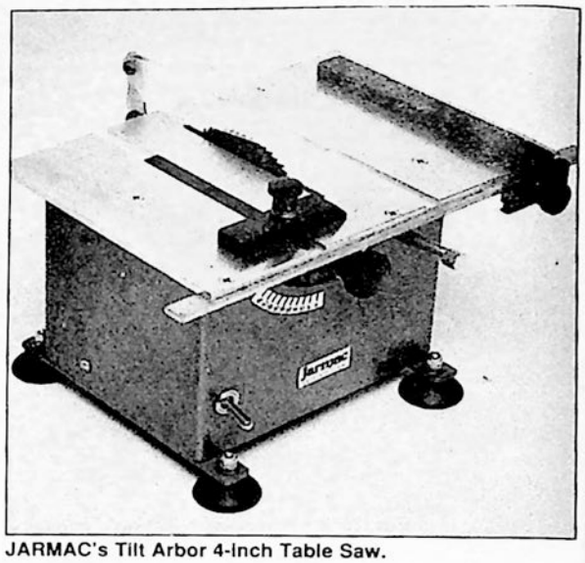
• • •

Along with his two other popular RC sailing craft, Herman Berger, of Pop Up. Mfg. Co., 27 Emerson Ave., Amityville, NY 11701, phone or Fax (516) 842-9309, now offers his replica of the 1992 America's Cup contender. The length is 60 inches, beam 14 inches, overall height 105 inches, displacement 19 pounds, and sail area 1400 sq. in. The hull is hand laid up, with three layers of six-ounce glass cloth with a white gel coat finish. The keel bulb is weighted, drilled, and balanced. Keel fin is pre-constructed, and bilge block is cut and drilled. Model can actually be constructed on the kitchen table (with wife's permission, of course!). Tools needed include a drill, pliers, screwdriver, and sandpaper (Don't tell her about the sandpaper!). The hardware is nylon, aluminum, stainless steel, fiberglass, and mylar. Complete kit, less radio, sail mechanism, and batteries, is $395. Herman can fill you in on other details.

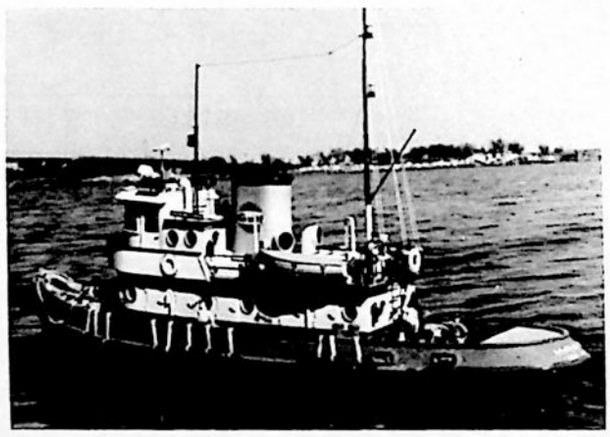
• • •

JARMAC, Inc. P.O. Box 2785, Springfield, IL 62708, phono (217)

Herman Burger with his Pop Up Mfg. Co. 12-meter, Catamaran, and America's Cup 1992.


JARMAC's Tilt Arbor 4-Inch Table Saw.

789-7290, producers of bench-top power tools for the hobbyist, has introduced a modified version of its Four-Inch Tilt Arbor Table Saw. This version includes a four-inch fine-tooth blade with support cup washers. In addition to leaving a smooth, clean edge on wood, it will also cut non-ferrous metals, such as that used in stained glass projects. Contact JARMAC for more infomation, and tell them where you read about it! •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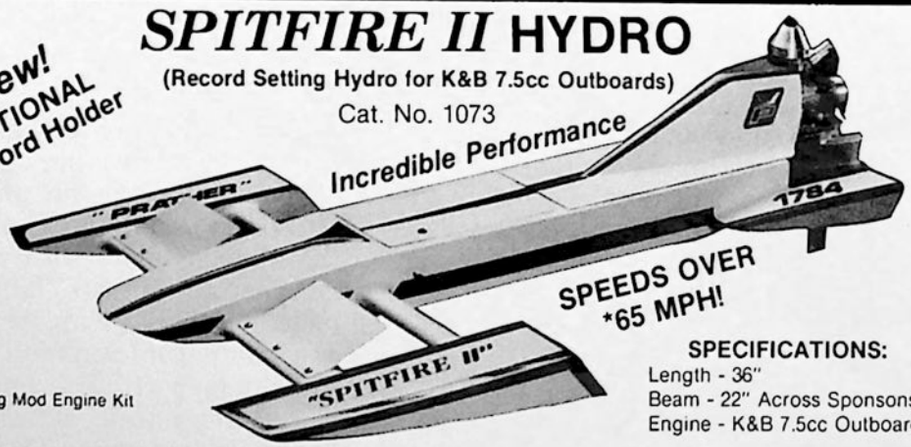

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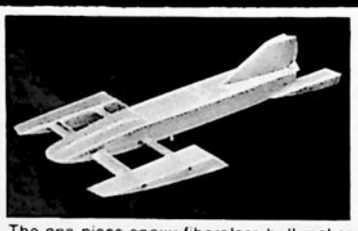
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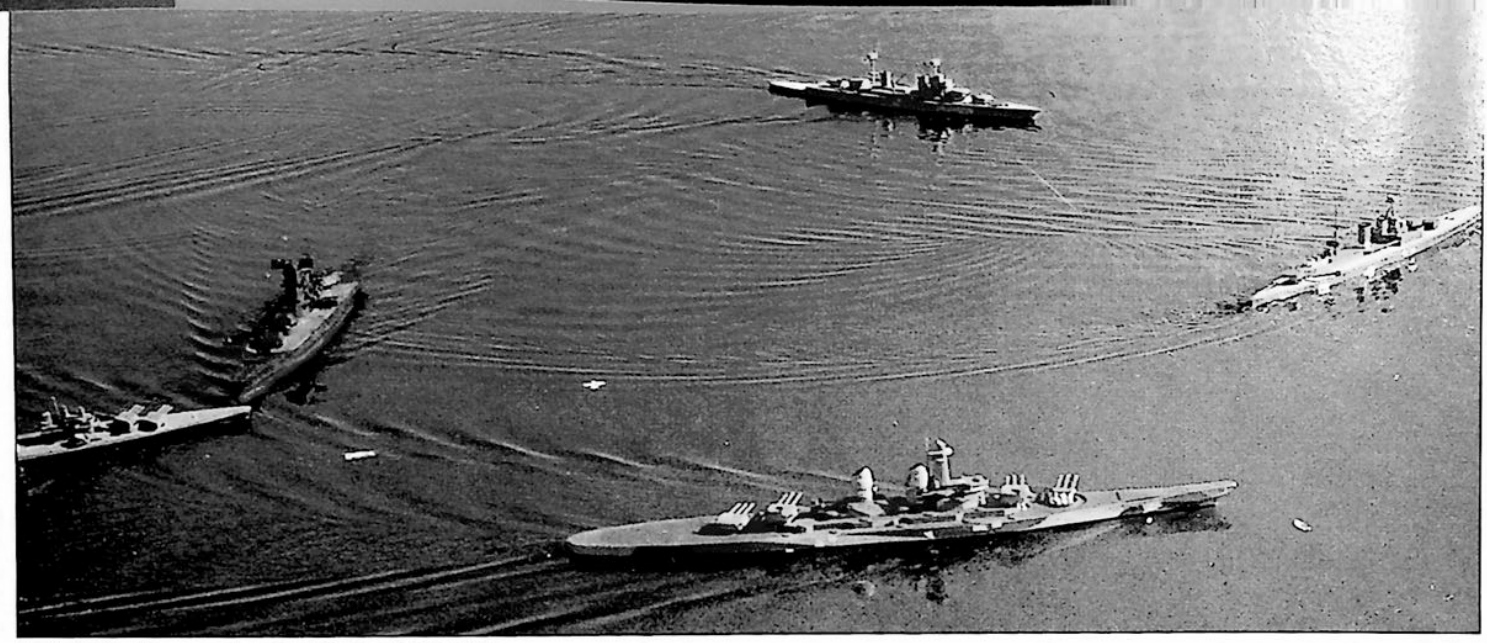


A pitched battle rages between Allied and Axis ships.

RC COMBAT
WEST COAST STYLE

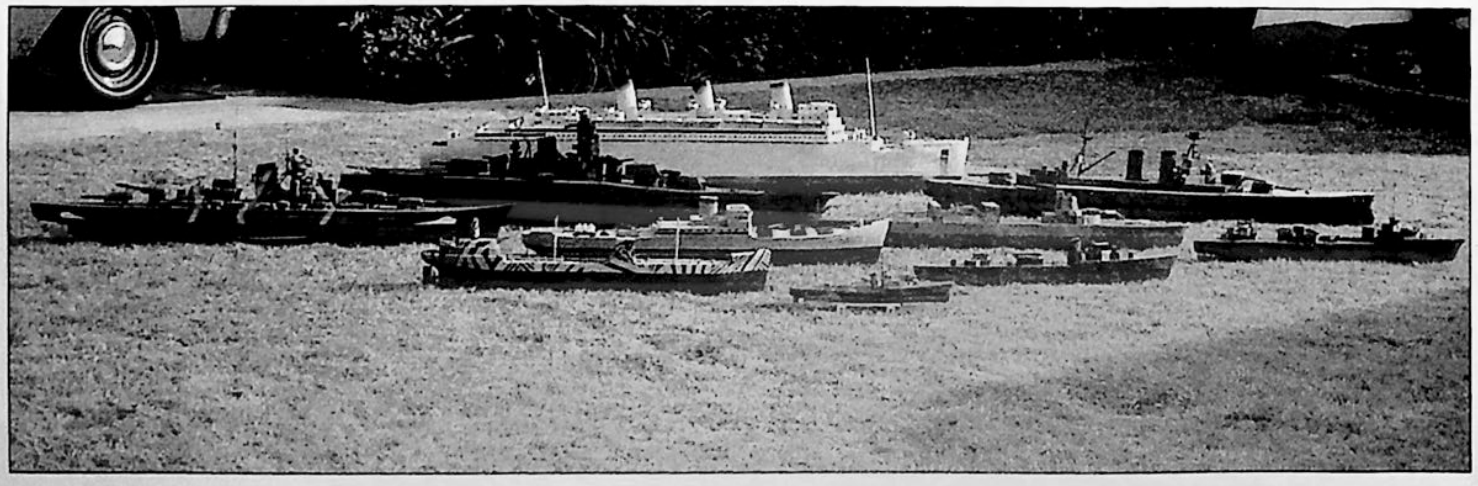
BY JOHN WHITE

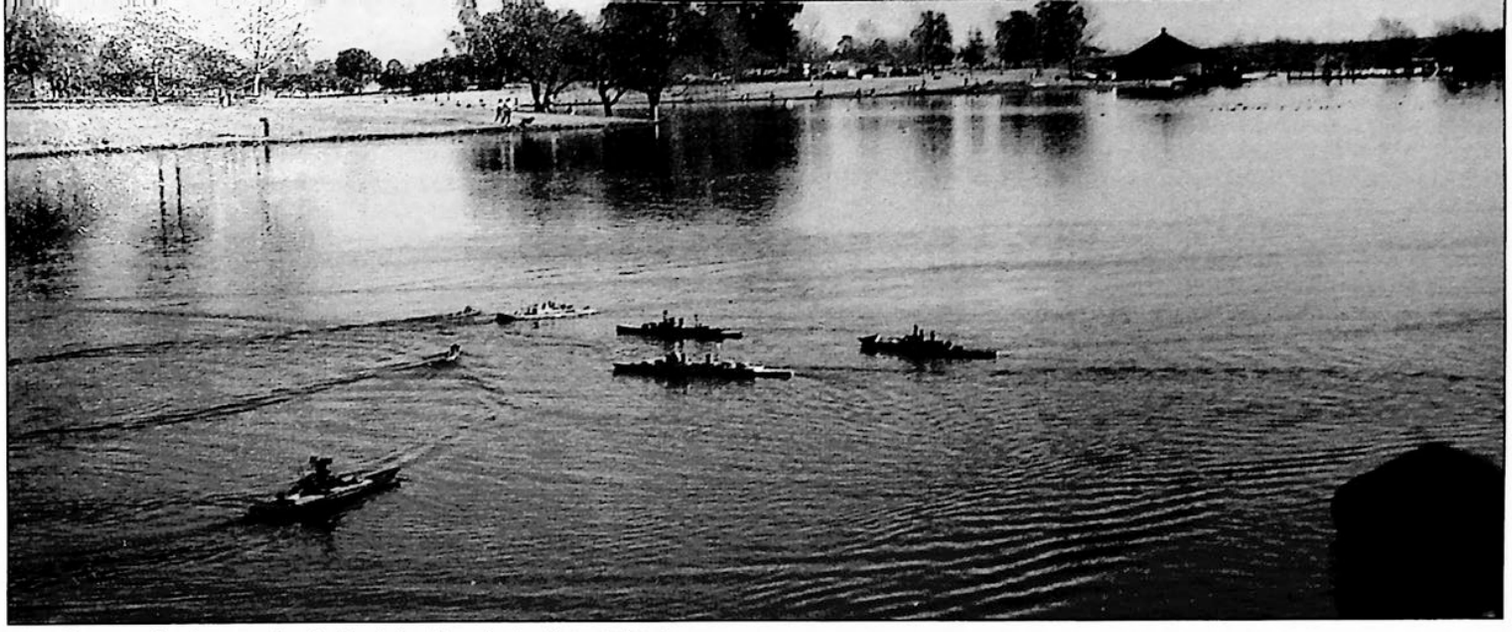
Short of sex or actually being shot at, RC Combat can be the most exciting 60 minutes of your life!!! When I think back to a recent battle at Prado Dam Park (Southern California), I remember the butterflies in my stomach as two opposing fleets set sail, ready to do battle in the early morning hours. Tensions ran high, but all hands knew their jobs and the commanders had planned well. Due to attrition, both fleets were a bit light, but the determination of every skipper had not waned.

The Axis fleet was patrolling the Western seas (Prado Dam Park pond) in search of the Allied convoy. The Axis command consisted of the light cruiser *Atlanta* and heavy cruiser *Louisville*, led by the battleships *Bismarck* and *Jean Bart*. Axis Fleet Commander Jeremy had sworn that not a single Allied ship would reach its home port! His head was riding on the outcome of this conflict.

The Allied fleet had departed the Eastern shore on a course of 270 degrees in search of clear waters for her convoy. The convoy consisted of the oilers *Richmond* and *Klamoten* and cargo ships *Victory* and *Kormoran*. Fleet protection was provided by the destroyer *Le Terrible*, heavy cruiser *Bremerton*, and led by battleships *Ohio* (Montana Class) and *HMS Lion*. Allied Fleet Commander "JC" was prepared to sweep the seas of the merciless Axis raiders. Low be the knave who would attack a helpless transport carrying baby food and milk bound for hungry children . . . a

Author owns a large fleet, everything from mine sweepers to battleships; *Queen Mary* in the rear.





Fleet Commander Jeremy directs his Axis ships during the mayhem.

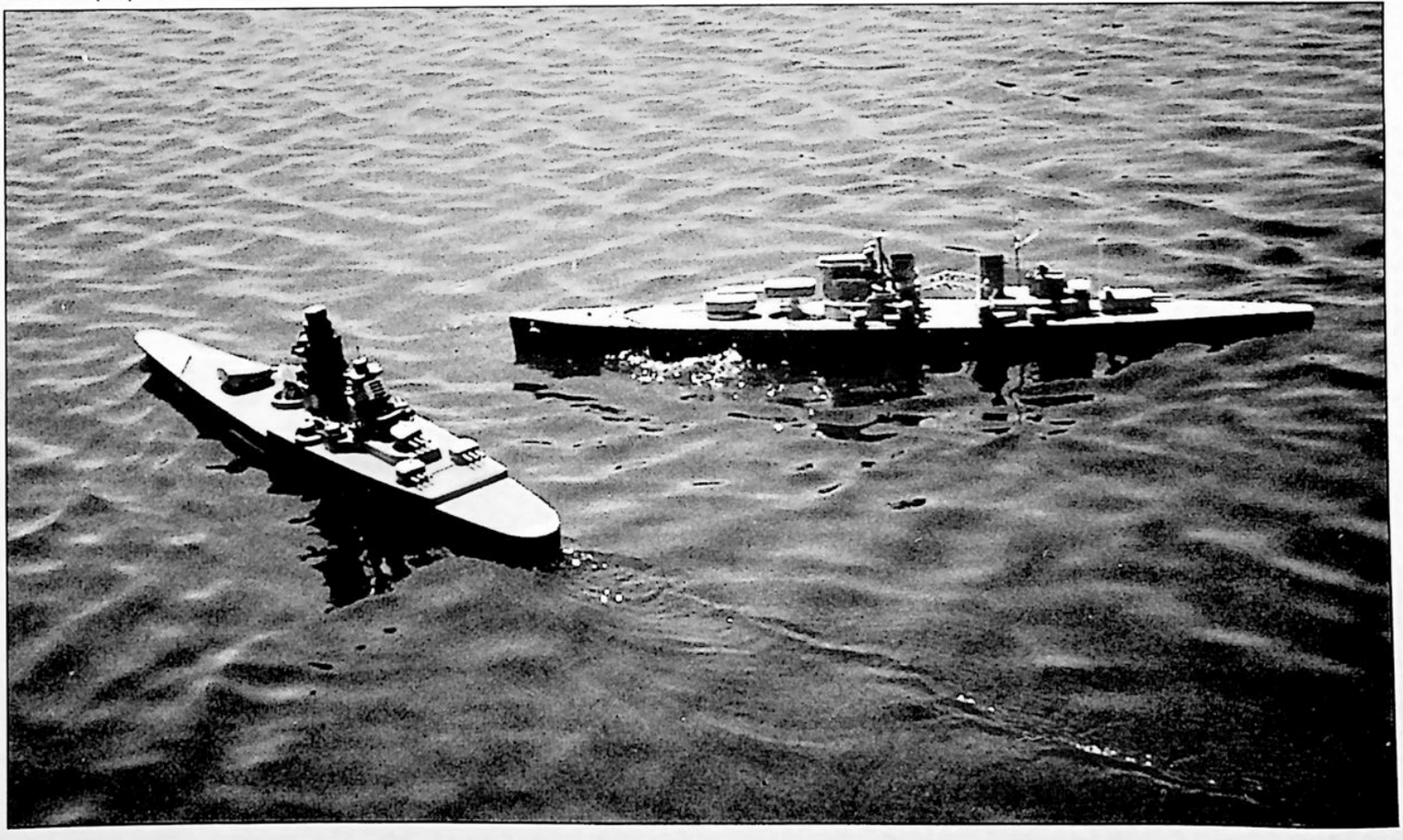
few tanks and cases of ammo in the hold were of no consequence.

Shortly after setting sail, the Allies were spotted. The convoy was immediately ordered to break left and head due south. The escort continued due west in harm's way. Moments later a great sea battle began. The *Bismarck* and *Ohio* began exchanging salvos, while the *Bremerton* and destroyer *Le Terrible* made an end run to hammer the *Louisville* and *Atlanta*. On the first run, the destroyer put two torpedoes into the Axis cruiser. Within thirty seconds the *Louisville* went down hard by the bow. Apparently one torpedo hit the cruiser's ammo locker (CO_2), severing a line, and after she went down the sea boiled for some time about the wreckage. This was a heavy loss for the Axis!

While the cruiser was going down, the *Bismarck* broke contact with the *Ohio* and headed south, where she came upon the unescorted convoy which had turned west. Fleet CO "JC" bore witness to the fox in the hen house! The *Ohio* and her cruiser were in hot pursuit, but before they could reestablish contact, the *Bismarck* put two salvos into the *Victory*, sending her to the bottom immediately! The convoy scattered, but not before the *Bismarck* put two rounds into the *Klamoten*. The *Ohio* reengaged and the two battleships slugged it out for several minutes, each taking several hits. The Klamoten had just barely reached the shore when she settled to the bottom in shallow water.

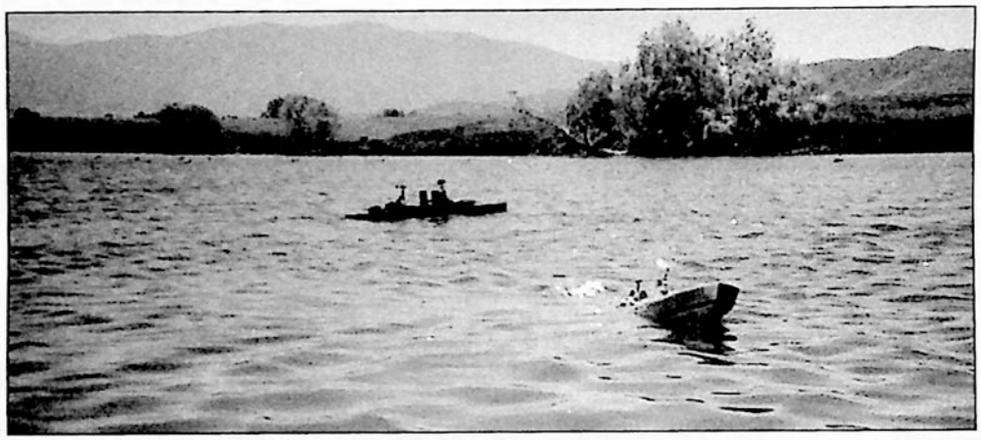
In the middle of all this mayhem, the *Jean Bart* and *Lion* were continually locked in mortal combat. It

Jean Bart (left) fires on the *Lion*.



looked like the *Lion* had the upper hand with her first two salvos making solid hits in the *Jean Bart*'s port side, at the water line. But the tables quickly turned when the J.B. put three eight-round salvos into the *Lion*. It was only moments later that the *Lion* began to go down by the bow, but at the last minute upended and sank by the stern. The sea boiled as the mast, with colors flying, was the last evidence of her beauty slipping beneath the icy waters. A terrible loss for the Allies.

The battle raged on as the destroyer *Le Terrible* sought out the *Atlanta* and desperately tried to run her down to put 'fish' in her before she reached shore for additional torpedoes, but to no avail. The destroyer then turned seaward to make a lone suicide run on the *Bismarck*, while the *Ohio* continued to pound her. *Le Terrible* came upon the *Bismarck*'s starboard side and fired a torpedo, making a solid hit, but in turn took two hits from the battleship's #1 turret. The destroyer lay dead in the water as the *Ohio* forced the *Bismarck* to turn away. In doing so, the *Bismarck* ran into the path of the oiler, *Richmond*. Not surprisingly, the *Richmond* immediately suffered heavy damage from the battleship's #1 and #2 main batteries. She limped away only to sink about nine minutes later. The *Ohio* continued in hot pursuit and the two heavies again exchanged many salvos. The cruiser *Bremerton* had suffered a catastrophic weapons malfunction and could only run interference on the Axis cruiser.



The damaged *Lion* slowly sinks.

At this point, the Allies had lost three of their four convoy ships, a battleship, and their destroyer was dead in the water. The Axis had lost the cruiser *Louisville*, while the *Atlanta* had suffered a 70% power loss to her engines and she could just barely make way.

As the battleships continued to slug it out, their maneuvering brought them into the area of the disabled destroyer. Lunch was immediately served; the *Le Terrible* was the main course. The *Bismarck* took the opportunity to put nine rounds in her starboard bow, and the *Le Terrible* immediately went down with her stern high out of the water in her last death throes.

As the battle wound down, the cargo

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vessel *Kormoran* took some damage and was only able to make way astern.

At day's end, the Axis had clearly won, Fleet CO Jeremy was able to keep his head. Interesting note: Fleet CO Jeremy is the son of Fleet CO "JC." What is this younger generation coming to, beating up on his father like that?

After reading that, you can't tell me it didn't tickle you somewhere. Didn't it bring back memories of those days long past when you were a kid and shot up (or worse) your old models? Well, it's OK now because *we're adults!* That's oversimplified, but some of those same dreams and fantasies of our youth still linger, *regardless of our age* (I'm 45).

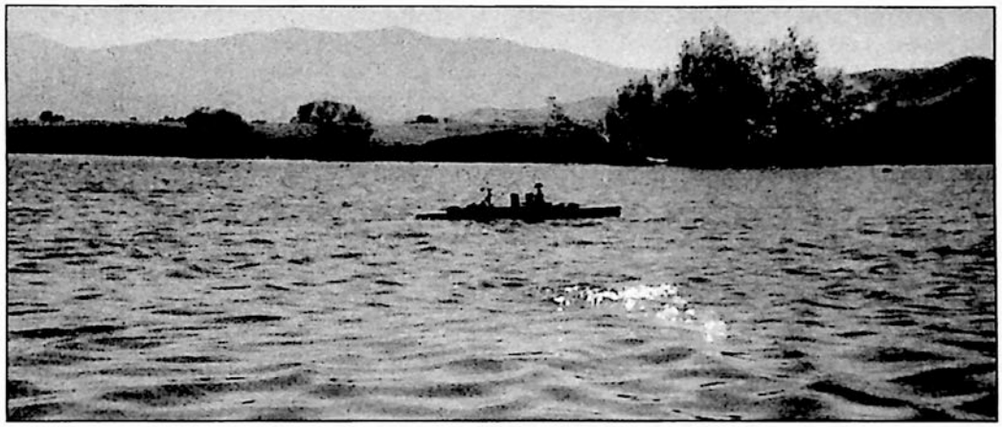
In the next few minutes, I want to give you a good overview of RC Combat - West Coast Style. While the East and West Coast formats both build ships in 1/144 scale (1/12"=1') primarily of balsa wood, that's generally where the similarity ends. Both formats work well, but each has a different emphasis. Our emphasis is circa WW II with each type or class of vessel maintaining its particular advantages and disadvantages.

Today's RC combat operations and vessels are far more involved than just 'shooting up' an old model. Our goals are to (1) have fun, (2) sink your opponent, and (3) sail over his bubbles. Anyone found not having fun will have their cookies summarily crushed with great prejudice!

SHIP TYPES

We're building battleships, carriers, cruisers, destroyers, freighters and an occasional submarine thrown in for good measure. All ships are of types built between 1900 and 1946, from any country. Ships from any Navy that were an approved design, but never completed, are called "Hypotheticals" and are authorized with approval of the club's Technical Officer. Popular "Hypotheticals" are the American *Montana* Class, British *Lion* Class and German *H-39* Class battleships. The ships fire BBs of four different calibers and torpedoes, using standard radio control systems (surface frequencies).

"Which battleship should I build?," is one of the most frequent questions asked when a new skipper has been smitten with the bug. One might think that a battleship is the most



The flag of the *Lion* is the last vestige visible as the sea boils.

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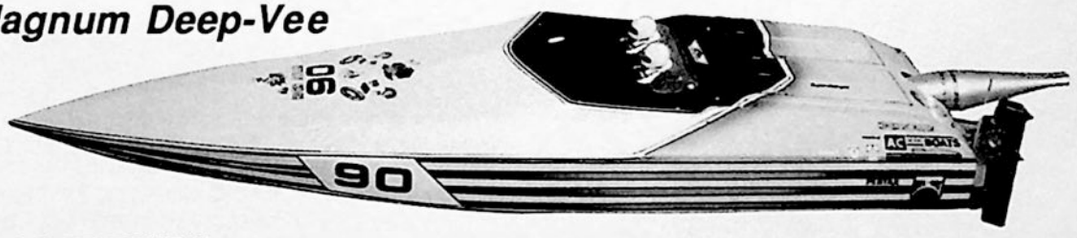

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obvious choice of vessel for combat as they're *big and have big guns*. Not necessarily so. Every class of ship has *very real* advantages and disadvantages, and therefore, has to be fought differently. For example: Battleships have large caliber and long range guns and are difficult to sink because of their armor and huge displacements. On the down side, they accelerate and decelerate slowly, slow down significantly in the turns and are *large targets!*

At the other end of the scale are the destroyers. They are very fast, accelerate and stop on a dime, and are very small and therefore, hard-to-hit targets. Yes, there's a down side, to wit: the destroyers displace so little water, they won't take any punishment. One or two hits in the hull and they're headed for Davy Jones' locker! Cruisers fall in between the battleships and destroyers, and support medium size guns, but have torpedoes.

WEAPONS SYSTEMS

Four calibers of guns are used, depending on the size of guns on the original vessel. Six-inch guns use .177-inch BBs, eight-inch guns use 3/16-inch BBs, 11-inch use 7/32-inch, while the larger guns use 1/4-inch ball bearings. The rate of fire is governed by the caliber, i.e., .177-inch and 3/16-inch may fire as fast as once every four seconds, while the other two larger calibers can fire no faster than once every eight seconds. The logic is that a six-inch gun can be loaded and fired faster than a 16-inch battleship gun. Hence, we endeavor to maintain the "advantage/disadvantage" of ships as occurred in WW II. While most are fixed, the front and some rear main turrets rotate, so that ships that lay abeam may also be engaged.

Torpedoes are up to 3/4-inch long and 1/4-inch in diameter and usually we use .243 70-grain bullets. Torpedoes are fired over the water instead of through it, as current technology has not provided our merry band of "balsa breakers" with an effective underwater system; but we're working on it. As occurred in WW II, torpedoes are a short range weapon, but can be very effective. We have strived not to develop nor use a disproportionately destructive weapons system. Hence, there is a time and place to use the 'fish,' but they are by no means a 'super weapon.'

All projectiles are propelled either by CO_2 or by an on-board air compressor, but regulated to a maximum of 100 psi. No Freon is used on the West Coast. That was strictly an environmental decision by all clubs.

SPEED AND RECOVERY

A sliding chart is used to determine the speed of a vessel and is measured in seconds through a 100-foot trap. For example, the *Bismarck* would run approximately 39 seconds through the 100-foot course. Speed is very closely governed, once again, to maintain the advantage/disadvantage of a particular vessel. So a 28-knot *Yamato* suffers a real disadvantage, compared to a 33-knot *Iowa* Class battleship. Probably the most widely used speed control is the Ace RC unit, because of it price and reliability.

"What if my ship sinks?" you ask. If you fight often enough, you will get it shot out from under you! No problem. All ships are required to have a flotation device with a line attached to the hull. As the electronics are in a water tight box, they're safe (most of the time). To recover a stricken vessel we stop the game, row out to the boiling water and pull it up. Fre-

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quently, no more than thirty minutes or so is needed to put a ship back into combat commission.

GAMING CONCEPT

The two opposing sides are divided into the Allied and Axis fleets. Usually each ship fights on the side it originally belonged to, but to insure the sides are somewhat balanced, a Combat Factor (CF) system is used. "X" number of points are totalled for a ship's speed, number and caliber of guns, hull thickness, and number of rotating turrets, to establish its CF. When we add the CFs for each fleet, occasionally it is necessary to move a ship or two to the other side to roughly balance the combat capabilities (note example in the battle at beginning of article).

As the transports and oilers haul the war assets (ammunition), so mission priorities become clear. Each fleet is tasked with defending its own convoy, sinking the opponent's convoy, and attacking or holding at bay the other's combat vessels. HOW the Fleet Commanders accomplish their missions is what RC Combat is all about! Reliable ships, gunnery, team work, communications and tactics are the major variables that dictate how effective a skipper and his vessel will perform. With this in mind, we've discovered there is no *one best ship to build*. Speed, number, and the ship's size are the only considerations. Each type of ship has different capabilities and characteristics, and therefore, *must be fought differently.*

SAFETY

This is, of course, paramount. To the best of my knowledge, no one has ever been hurt in RC combat and we want to keep it that way! To insure BBs do not go astray, no elevation is allowed on the guns and all ships must have safety plugs over the barrels when the ships are out of the water. Further, all persons in the area of the battle must wear safety goggles or move to higher ground. Despite the strict safety procedures followed, we still require NAMBA membership (insurance) by all members with ships having weapons. Due to the liability restrictions, those skippers under 16 years of age may only drive unarmed transports, but they have a ball . . . the kids do a great job.

GETTING STARTED

Below I've listed the four clubs on the West Coast. Give any of them a call and you'll be delighted at the team work and camaraderie in helping you select and build your first combat vessel. I can guarantee that before you finish your first, you'll be talking about and planning your second. RC Combat is addicting. And it's a family hobby, too. Your wife can provide moral support (and dinner in the garage) while the kids learn some new words when you glue your fingers to the balsa wood. This hobby will bring the whole family untold hours of fun, anxiety and good fellowship. We look forward to seeing you on the pond. God's speed and check for loose connections.

CLUBS

South Coast Battle Group; "JC" White, 7242 Bestel Ave., Westminster, CA 92683, telephone (714) 894-3631.

Task Force 34; Dave Backus, 2988 Oak Leaf Drive, Cameron Park, CA 95682, telephone (916) 676-3522.

Western Warship Combat Club; John Kort, 1903 Baywood Square, San Jose, CA 95132, telephone (408) 251-7955.

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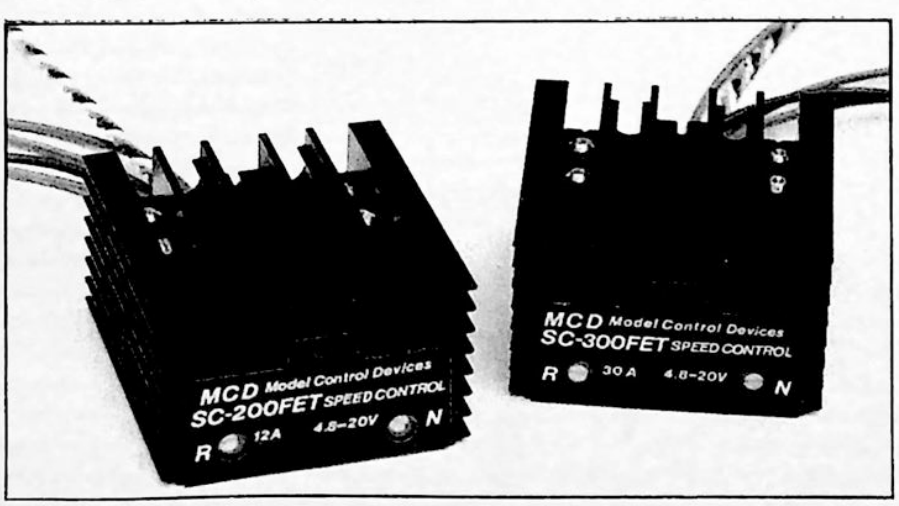

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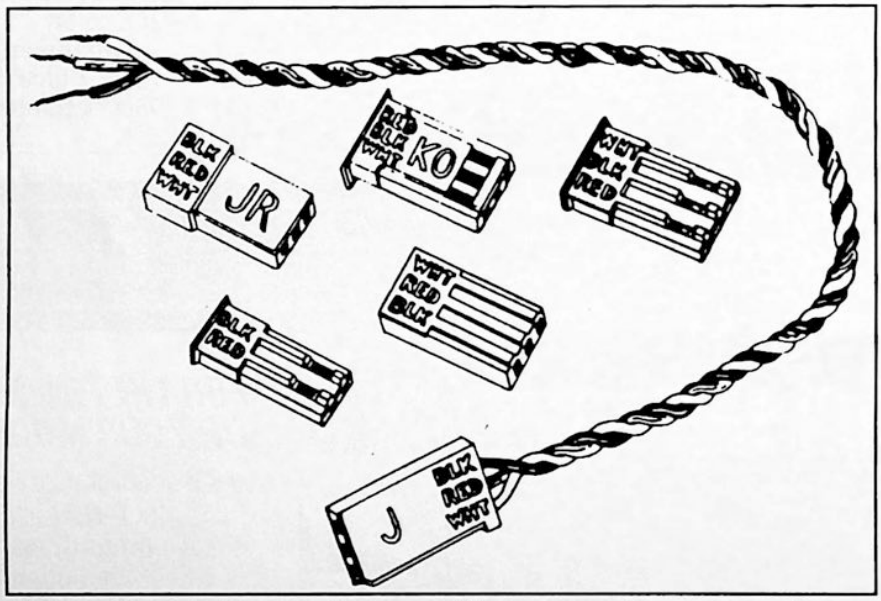
RADIO WAVES

BY ELOY MAREZ

MORE CHANNELS

Adding channels to the RC system, as described in our Spring '91 edition, generated more mail than any other "Radio Waves" column that I can remember. Obviously, there is a lot of interest in so doing, and I am glad to report that there is further information on the subject. The whole thing started with a query from a reader who was looking for a less expensive way to obtain the multi controls required for scale operations, similar to that offered by the Vantec "Keykoder." My solution was admittedly rather crude, but it was something that the average hobbyist can do, and I was definitely right in that more sophisticated systems were beyond the scope of the non-electronics expert. As you will see, the commercially available units that I will be telling you about are definitely too complicated for the average home builder. But they are simple to install and to use, and still within the budget of the serious scale boat fan. Read on! The first manufacturer we have to thank for making practical equipment available to us is:



The Novak (Electronics) Input Plug System, a multi-purpose servo harness that can be easily changed to correctly mate all accessories to any of the popular RC systems.

Airtronics, which has recently introduced its popular "Vanguard" four, six, and seven-channel systems specifically intended for the scale boater. Before you got this far, I'm sure you spotted the photo, and thought: "So what, it's just another airplane style two-stick transmitter." Well, yes, to some extent, but with TWO very important differences:

(1) Vanguard systems are available on the boat-legal 75 MHz band. Check around, few other similar systems are. Some can be converted for additional cost (and time!) after you have first bought an airplane frequency system, but not all can be.

(2) This is a modern FM (Frequency Modulation) narrow band transmitter and receiver system, that meets all Federal and model association technical requirements.

Let me expand on that a bit. The radio control hobby as we know it today had its start in the early fifties, with the FCC (Federal Communications Commission) assignment of ONE license-free frequency, 27.255, which we all shared. Later on, we were granted five more 27 MHz spots; the one's still in use to this day. As the number of hobbyists increased, the need for more frequencies (channels) became apparent, and fortunately for us all, the AMA (Academy of Model Aeronautics) took it upon itself to negotiate with the FCC for their assignment. We have to see it like it is . . . without the efforts of the AMA, non-flying models, including RC boats, would probably still be stuck on 27.255, as boaters are far from united and with little clout as a group. Similarly, the RC car enthusiasts spend all their time fighting amongst themselves, with some real questions existing in the organization and operating of ROAR (Radio Operated Auto Racing), their national body. Anyway, AMA went to bat for all of us, with the subsequent present assignment of separate frequencies; 50 of them on 72 MHz for flying and 30 on 75 MHz for non-flying (boats or car) models. It is important to remember that 27 and 75 MHz are the only frequencies on which you can operate your RC boat without being in violation of Federal law!

Along with the assignment of all those frequencies came some technical problems, that of bandwidth. Width in the case of a radio signal is no different from width in anything else . . . you can put a lot more clowns in a Volkswagen if they are short and skinny than if they are tall and fat. In order to get more channels in the total frequency space allotted to us, we had to make each individual channel narrower, i.e., to occupy less frequency space. Again through the efforts of the AMA, standards have been set for both transmitters and receivers that will allow us to operate our models without radio interference to each other.

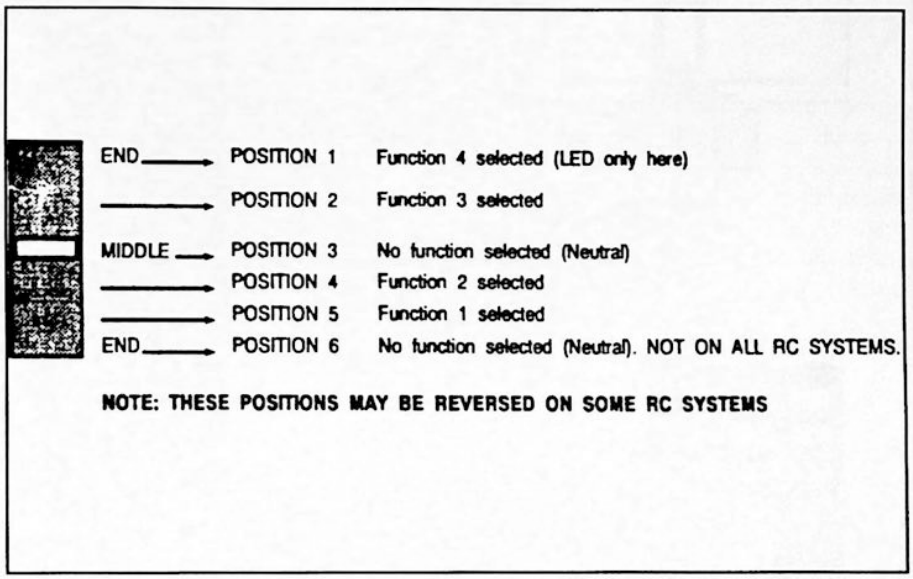
This is important in that if a transmitter is radiating too wide a signal, it will interfere with those receivers operating on adjacent channels. Conversely, a receiver that is capable of receiving extremely wide signals will react to those transmitters operating on adjacent channels, even if the signal being transmitted is within an acceptable width. The term "bandwidth" now becomes clear, right? Narrowband, then refers to equipment that meets the established stan-

dards for skinny signal transmission and reception. In practice, the FCC can only legislate the bandwidth for a transmitter, and not for a receiver, as the latter cannot cause problems for others, only for its owner. As a matter of fact, Federal legislation now exists to the effect that as of March 1992, all RC transmitter MUST comply with all specified narrowband requirements. Manufacturers and dealers are given one year from that date, till March 1993, to dispose of non-narrowband equipment, and we are all allowed until March 1998 to wear out old equipment already in use, which must then be replaced with narrowband systems.

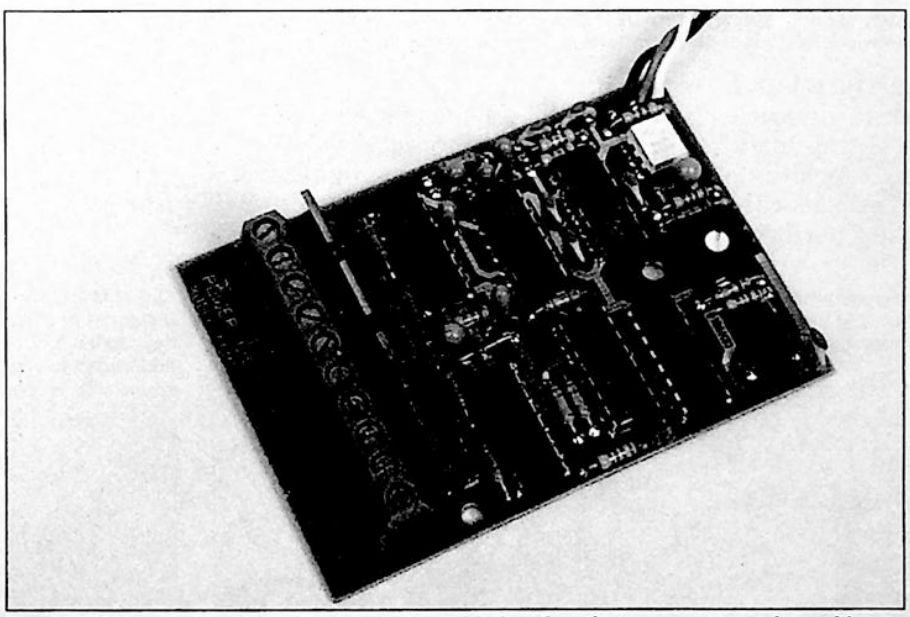
The receiver is another story; AMA has set some suggested standards for narrowband operation which have to be met for equipment that is to be used at sanctioned competitions. This is a good idea and one that should be adopted by all (how many are there?) boating organizations. To identify such equipment, makers and importers of transmitters are now voluntarily labeling their transmitters with "Gold" stickers to indicate their narrowband capability... and a list is published monthly by the AMA indicating which transmitters and receivers have been independently tested and meet the established narrowband criteria. Not all manufacturers have cooperated with the programs, and one should use some discretion in purchasing equipment that is not defined as able to operate in the narrowband, closely spaced environment and which will soon be illegal to operate.

As those of you involved only in water games have probably not seen this list of designated equipment, I'll be glad to provide one on the receipt of your SASE . . . sorry, but it is too long to include here. You will be surprised to discover what equipment is NOT on it!

Now back to the Airtronics Vanguard, which is on the list, both transmitter and receiver. This is "Gold," without a doubt, well made, totally dependable . . . and in extensive use in the model airplane world. It is available in basic four-channel versions, as well as expanded six and seven-channels systems, which also include other interesting features such as channel mixing and dual rates. All systems include NiCd batteries, charger, adjustable stick length and tension, and those all-important servo reversing switches. Vanguard prices start at around $120 for the four-channel system; not unreasonable for a system with all its features and modern design.



The transmitter stick (or lever) positions required to actuate the SWITCH 4 decoder unit. The logical 1 to 4, top to bottom sequence allows user to learn it rapidly.



The SWITCH 4 decoder described in the text, adds four functions to any transmitter without the need of any add-ons or modifications. Has lots of possibilities, see text.

Now for those added controls. The first possibility is a decoder, available from Model Control Devices (MCD), of Toronto, Ontario. As I mentioned in my original article, the adding of channels, or controls, to an RC system is a two-part process. It is necessary first to generate the control information at the transmitter, then to decode it in some manner after it has been received in the boat. MCD has a simple-to-install, connect-and-use, four-function decoder, which it calls a "SWITCH 4," that requires no changes at all to the transmitter in use, though it does require a little dexterity in the operation of the stick or auxiliary channel lever if one is to be used.

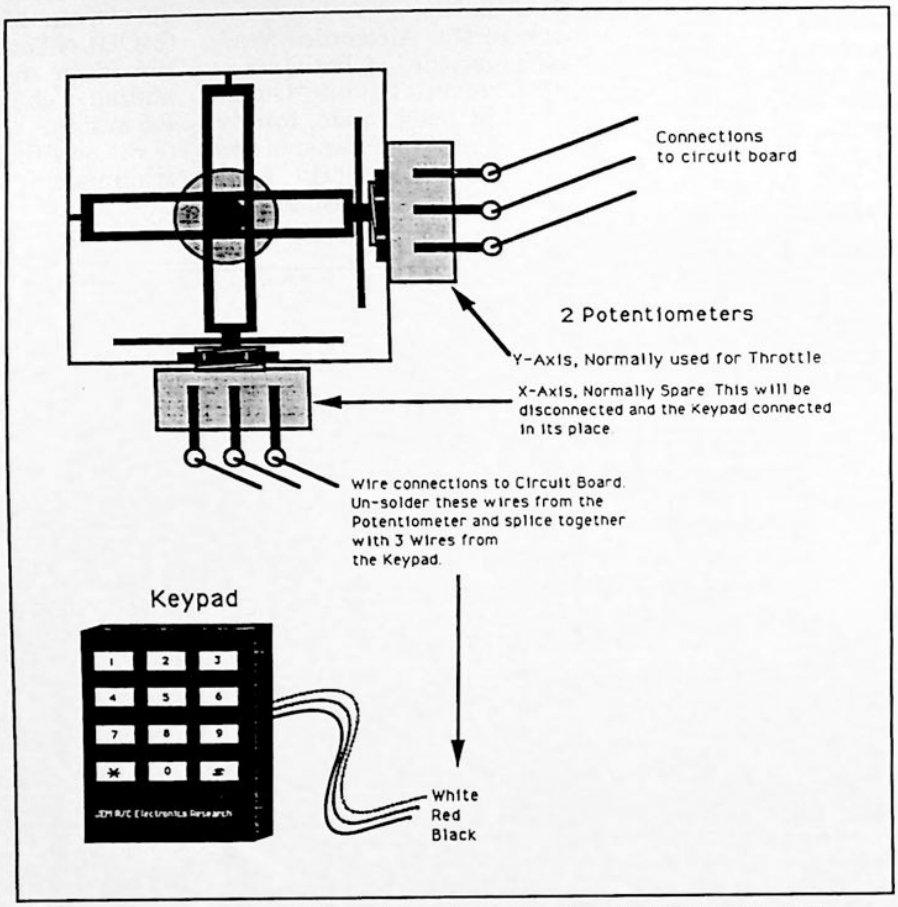
In use, the SWITCH 4 is simply plugged into the proper receiver channel, with of course proper connections then made to whatever auxiliary on-board equipment is to be operated. The transmitter channel is now converted to four separate and distinct functions, which can be either momentary, or latched. For momentary functions, the operation selected can be ON only as long as the transmitter's control stick or lever remains in the selected position, and will be turned OFF when either stick neutral or another position is selected.

Latched functions operate like the common Push-On, Push-Off switch, in that once signaled, it will stay ON, even though another function is used, until the stick is returned to the proper position a second time. All four functions can be easily set up for either momentary or latched operation as desired.

The SWITCH 4 operates from standard one to two-millisecond servo timing, and can be powered by from 6 to 14 VDC, with a current drain of

only five milliamps at 6V. Its switching capability is three amps continuous, 10A momentary, with detailed instructions being included on how to connect various low and high voltage devices in the boat. Size-wise, the SWITCH 4 measures 2.2 x 3.2 x 1.0 inches, and weighs 2.1 ounces. Electronically, it is a sophisticated design, using six ICs, an optocoupler, and MOSFETS to handle the switching chores. Mechanically, it is well built, requiring only normal care in its use and installation . . . and that you do your best to keep it dry!

In use, I found the SWITCH 4 easier to control than I anticipated. The control selection, as seen in the enclosed diagram, is done within a very logical 1 through 4 sequence, starting with 1 at the top of the stick or lever position. In very short order, I was able to signal exactly what I wanted, actually easier to do with the stick because of its spring loading center—now neutral—position, This is obviously easier to do at scale speeds, though in higher performance boats it might be best to incorporate a four-position positive switch selected control as I originally described.


Connections to circuit board
2 Potentiometers
Y-Axis, Normally used for Throttle
X-Axis, Normally Spare. This will be disconnected and the Keypad connected in its place
Wire connections to Circuit Board. Un-solder these wires from the Potentiometer and splice together with 3 Wires from the Keypad.
Keypad
White
Red
Black

Internal connections for the JEM Expander are few and easily made following the simple instructions. Use of other channels is also possible. See text.

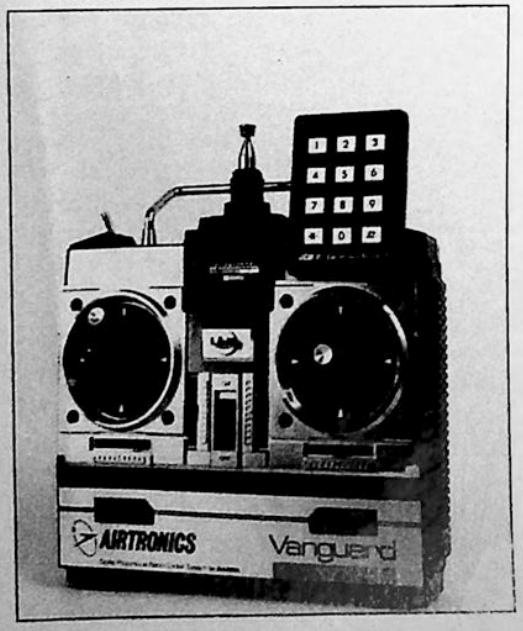
The SWITCH 4 is priced at $89.95 US, plus $4.00 shipping; is warranted for one year, and is available from Model Control Devices, 733 Millwood Road, Toronto, Ontario, Canada M4G 1V7; (416) 483-6702. You Canucks don't forget to convert that to whatever it is currently. So, it is a lousy pun . . . you get the idea!

JEM R/C Electronics Research, another Canadian firm, is also producing a channel expanding device, one that adds a keypad control to the transmitter, resulting in the addition of twelve extra functions to the system. It is called the JEM "Expander" and is available in two versions, the JM-112 with all 12 decoded outputs operating in the momentary mode, and the JM-112(A), on which the first six outputs can be set to either the momentary or the latched mode. JEM refers to the latter as a "toggle" mode, but it means the same; it will stay on until the next time a command is received.

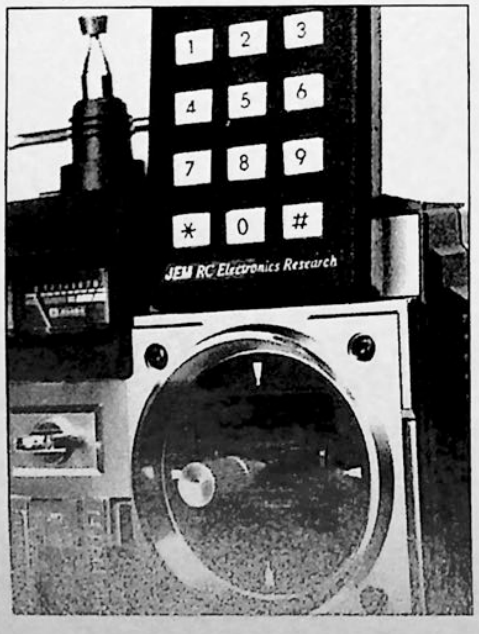
Installation of the JM-112 starts with the addition of the keyboard control to the transmitter. This requires some surgery to the latter, but it is minor and involves only the removal of three wires from the control potentiometer (pot) of

continued on page 30

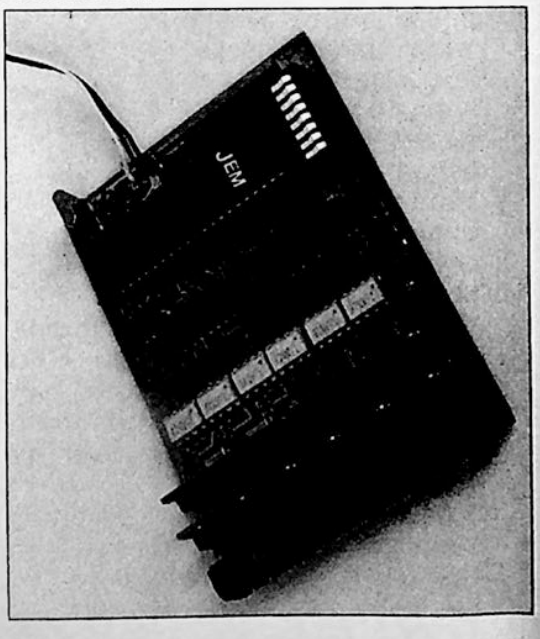
The Vanguard 4-channel system transmitter is seen here with the addition of the JEM Expander keypad control which adds 12 momentary or switched functions to it.



A close-up of the JEM keypad. It is just large enough so that the buttons are easily operated by the average size fingers, and one soon stops having to look while controlling.



The JEM Expander decoder, modern even to the inclusion of a microprocessor. Adds 12 switchable functions to any transmitter with the addition of keypad control shown.



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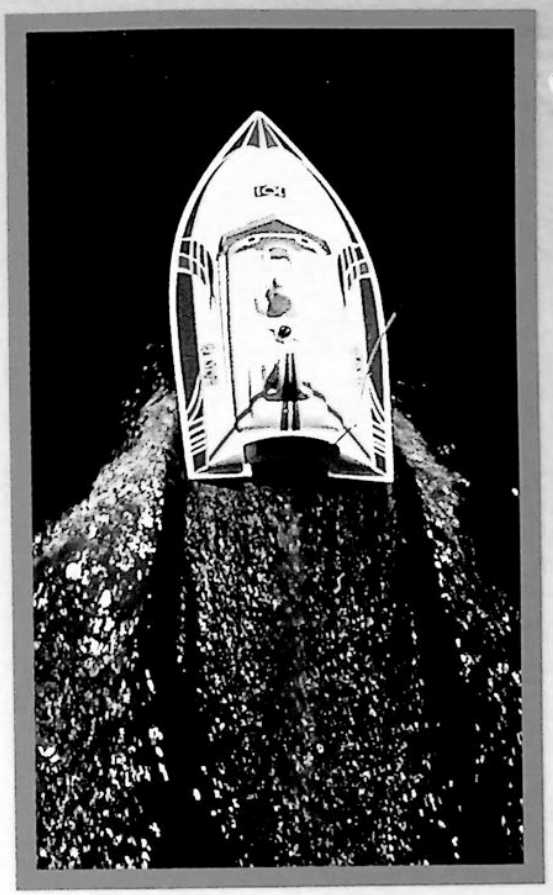

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PRODUCT SURVEY

BY ALAN HOBBS

AC MAGNUM DEEP VEE

At the first race of the season every year, model boaters look around to see what other boaters built during the winter. In May, 1986, I was walking through the Calgary pit area looking at what everyone was racing. A bearded fellow who I didn't know was working away at his table.

I met Andy Stischenko.

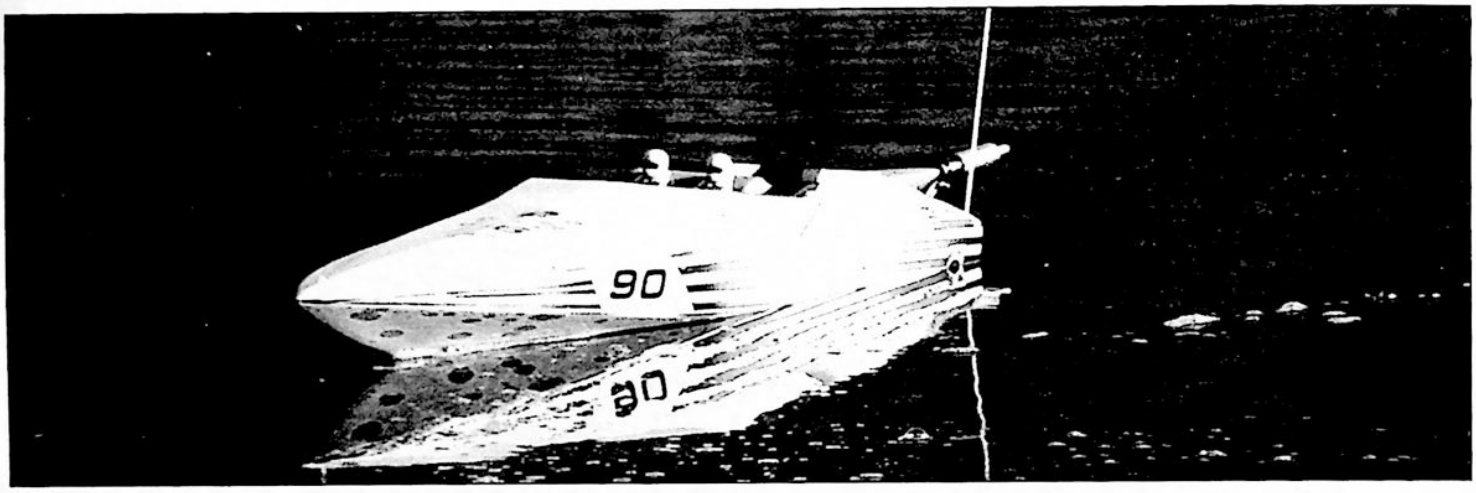
"What kind of hull are you using" I asked. The little tunnel hull had one of the best paint jobs I had ever seen, but the design was one nobody recognized.

"It's my own design," said Andy. "I think it should run pretty good because I used to run big boats. This

Slowly but surely, Andy worked out each handling problem. He also worked on his driving. By the end of the season, Andy was placing well in the outboard event.

"Are you going to change your design over the winter?" we asked Andy.

"No, this boat is going on the shelf



Obviously nervous, the new boater was having some difficulty getting his 3.5cc outboard tunnel hull ready to race. But he was very cheerful, with a ready laugh and a great outlook on our hobby. That was the day

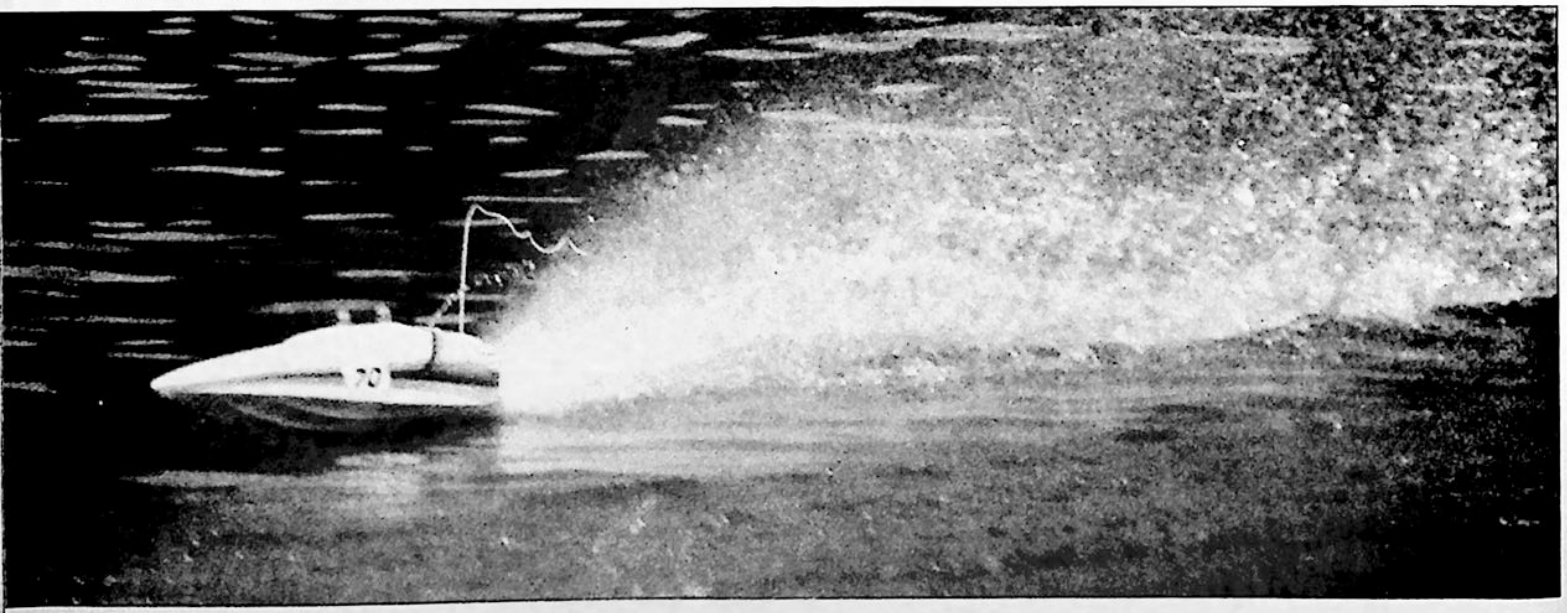
tunnel hull incorporates some of the design ideas we used in the full size boats."

That summer we saw Andy at every Calgary race. His tunnel hull, while beautifully finished, had problems.

for a few years. I'm going to make a fiberglass deep vee. I've been watching the mono and deep vee races and they look like fun. There are a couple of ideas I want to try."

Many boaters suggested that he

An inboard K&B 7.5cc engine powered Andy's boat to Canadian National Championship finishes at the Edmonton 1989 and 1990 APBA events.



just buy a Steve Muck mono and save himself a lot of time and trouble. But Andy wanted to work on his own design. We saw it the following spring at the first Calgary race. Featuring lots of strakes, high sides, and a scale cowl, Andy's 3.5cc powered deep vee was big and heavy.

Racing through the corners next to Andy was a harrowing experience. You never knew if or when Andy's deep vee would roll, spin out, hook, or just lose it. But Andy kept working on his design. Every race his driving improved and his design was handling a little better.

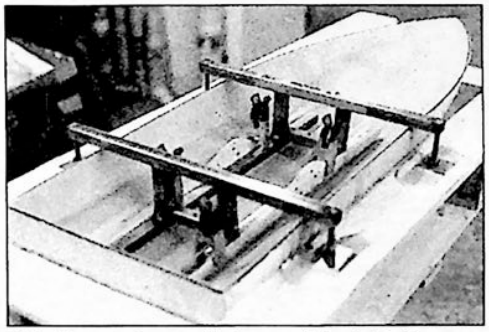
During the 1988 racing season, Andy brought out a 40-size hull to go with his older 20 boat. While still fairly high along the sides, these deep vees had improved bottoms. In rough water, Andy's boats excelled. But they still had difficulty racing in close traffic.

At the 1988 Canadian APBA National Championships, Andy's deep vees, racing in four classes, performed well in the rough Carburn Lake water. Andy was now in the fiberglass model boat business. A few boaters put in their orders for an AC Magnum hull of their own.

In 1989, Andy's design work was pretty well done. The rougher the water the better the AC Magnum boats performed. With a lower profile, wind was not as great a factor as before. A subtle keel entered the water gradually, providing better handling and consistent cornering.

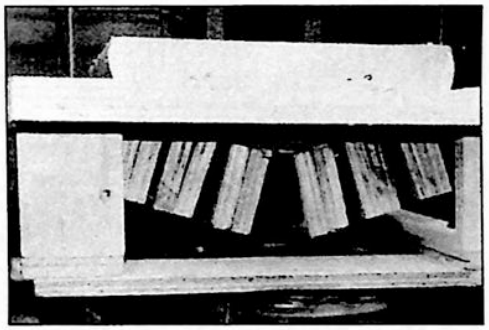
Edmonton hosted the 1989 Canadian Nats, and very rough water greeted the boaters. Andy's boats dominated in the rough conditions and several more boaters ordered an AC Magnum. But the Magnum deep vees lost their advantage when the water was smooth.

More changes were made to the hull bottom. For the 1990 APBA Nats in Olympia, Washington, Andy modified his hulls for the calm conditions. Rob Duckering, an Edmonton, Alberta boat racer, drove an AC



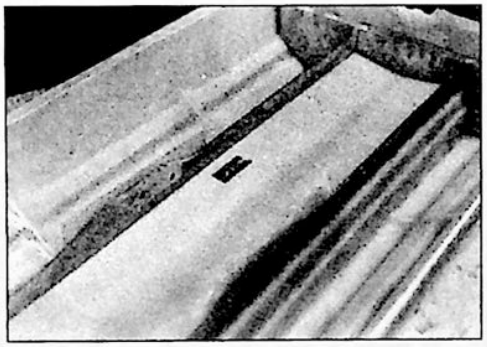
Metal braces insure that everything is held correctly while the Magnum deep vee cures in its mold. The plywood stringers are pre-drilled to hold standard engine mounts. The double sets of engine mount holes in this .60 to .90-size hull allow the boater to mount either a .60, .80, or .90-size engine, taking best advantage of the design.

In 1990 Andy brought out a very competitive catamaran design. The hulls are kept on special cradles in racks so that they won't develop hooks before finally curing. The fiberglass quality is second to none.

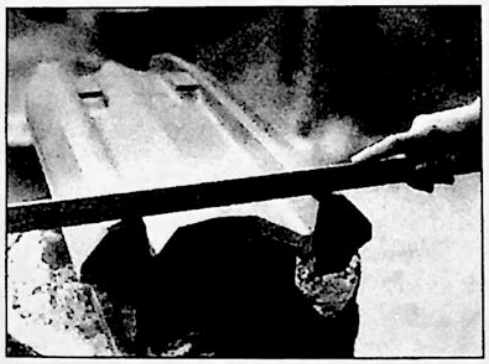


AC Magnum deep vee molds are strengthened with plywood to prevent mold irregularities. These molds do not develop a hook so you can be sure of a straight hull.

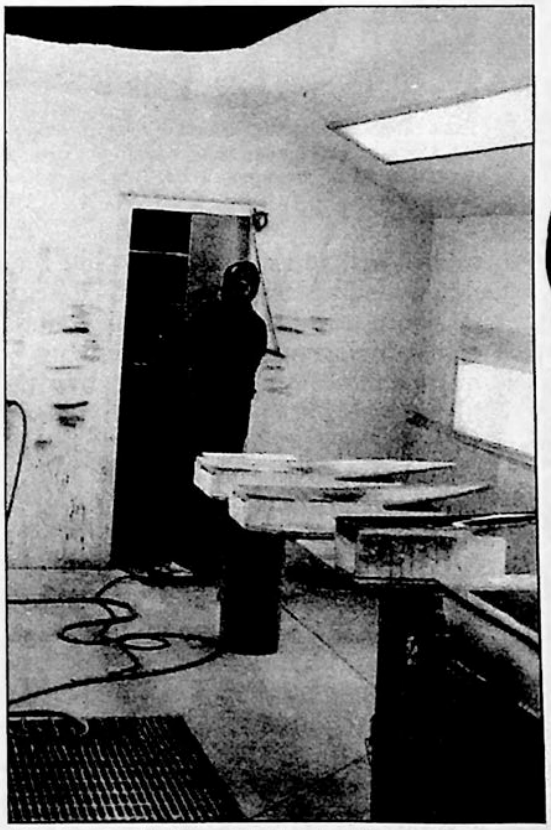
Andy Stishenko holds one of his .20-size AC Magnum deep vee hulls. It took four years of constant testing and racing for Andy to perfect his own design.



Every AC Magnum hull has plywood engine stringers and a transom support laminated into place. The AC name is also laminated into each hull as proof of quality.



Andy is working on his new outboard engine powered tunnel hull design. This hull is now available for 1991. Flat riding planes toward the transom reflect Andy's experience with the full size boats.



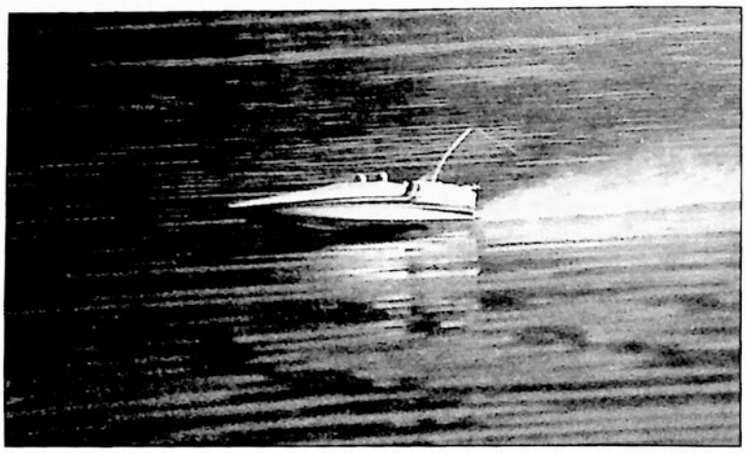
Attention to detail is evident at Andy's manufacturing plant. With special lighting, down draft air circulation, and years of experience, Andy gives his hulls the best paint finishes.

Magnum hull to the APBA 11cc Monohull Championship at the 1990 Olympia, Washington national championships. Andy's design had won a *US #1.*

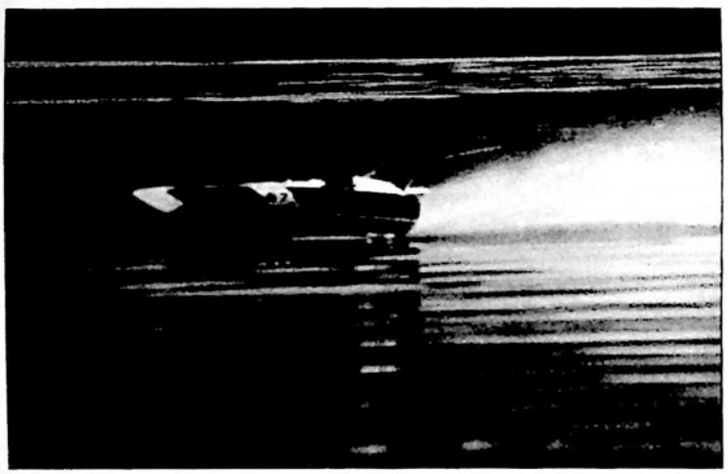
Finally, after four years of testing, tures of show cars, full size racing boats, and huge trophies. A beautiful Corvette, pictured with large trophies, caught my eye. Andy explained that it was a show car that he built, painted and took to a contest in need is a sport boat."

We got Mike a .45-size AC Magnum. Mike had never built a boat before and he wanted to do it himself, so it had to be kept basic. About one week later, Mike brought his new

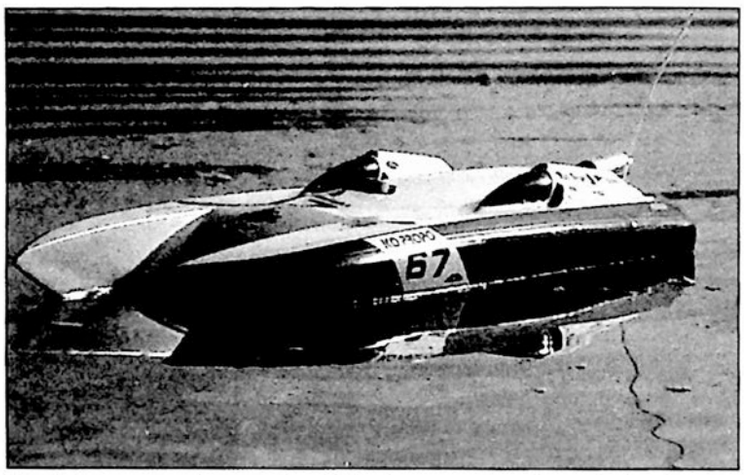
Rob Duckering, from Edmonton, Alberta, Canada, drove a Picco .67-powered AC Magnum Deep Vee to the 1990 APBA International Championship.



Andy's OPS 3.5cc powered AC Magnum Deep Vee features good handling and a super paint Job.



AC Magnum's new catamaran design is extremely quick, winning two 1990 Canadian APBA championships. This hull works well with .67 and .80 powerplants.



The AC Magnum catamaran at rest displays a semi-scale cowl, pleasing lines and one of Andy's beautiful paint jobs. Fiberglass radio boxes are available for the AC Magnum deep vees and catamarans.

modifying and changing, Andy had developed his own boat. This design is not a copy or clone of someone else's design work. The glasswork is quite excellent and Andy is justifiably proud of his AC Magnum deep vee.

Today, the AC Magnum is available in four different sizes. The "Wave Slave" is designed for the K&B 3.5cc Outboard engine. It is not just another 20 mono, but is actually balanced to get the best performance out of the small outboard engine. Three other inboard hulls are made for the .20-size engines, .45-size engines, and 60 to 90-size engines. All four hulls have a unique cowl available featuring molded-in cockpit area and drivers.

I visited Andy's compact factory to see how he manufactures his hulls. Along the walls are dozens of pic-

Hollywood. Yes, it won first place. And yes, Andy made it. He actually made the molds and built his own fiberglass body. Andy Stischenko knows what he is doing when he works with fiberglass.

Each Magnum hull is laid up by hand. Special clamps hold the plywood doublers and stringers in place while the hull cures. Each mold is doubled with heavy plywood bracing to prevent any flaws in the finished hull. The molds do not wear out quickly, inducing a hook in the later finished hulls.

When I got home, Mike Fisher, a local RC car enthusiast called me. "I want to build an RC powerboat, Al. We go water skiing all the time and I'd like a sport boat to run. You know, jumping wakes, messing around, that kind of stuff. I'm not going to go racing with all you fast guys. All I

boat over to my house and wanted to know when we could go test it. He had built his first boat and it did look good. The following Saturday morning we fired it up and threw it in.

Of course the hull needed some trimming, but by the fourth or fifth run, the AC Magnum was running well. Here's how Mike built his deep vee.

First, a boat stand was made out of plywood to hold the boat steady. This boat stand was used to hold the boat while it was being built and now is used to hold the boat while the engine is started.

A Marine Specialties motor mount fit into place. For power, Mike used an OPS .45 marine engine with stock tuned pipe and carburetor. The motor mount was drilled and tapped to hold the OPS engine firmly in place.

Magnums are designed to use the

Octura Offset "Strudder." This strut and rudder combination bolts onto the transom and simplifies hardware installation. Ride plates and a turn fin were bolted onto the transom.

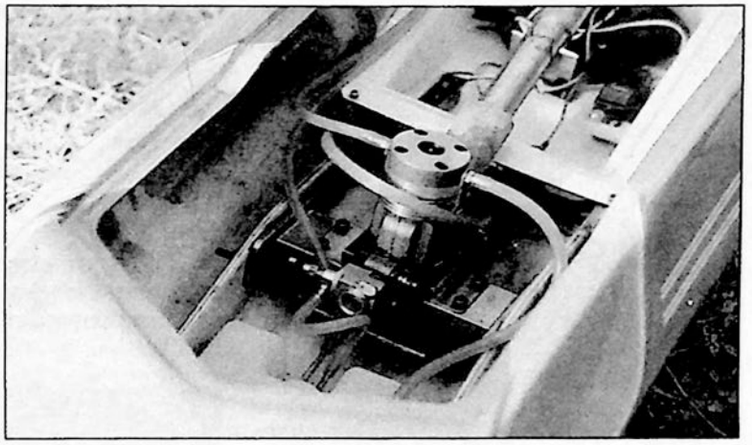
Use a straight edge to be sure that the ride plates do not extend below the hull bottom. If the ride plates do extend below the hull, they will cause undue drag, slowing the boat and making it hard to handle.

Adjust the strudder so that the strut holds the stubshaft about 3/8-inch below the vee bottom. Slide a section of 3/16 rod through the bearings. If the strut is installed correctly, the rod will remain centered over the keel line throughout the hull's length.

When the strut is bolted correctly in place, you can install the stuffing box. The engine cable nut will be pointing at a spot in the hull floor. This is the point where the stuffing box should enter the hull. Cut a slot in the hull about a 1/2-inch wide and two inches long.

Fit an Aeromarine teflon-lined stuffing box between the engine cable

Mike Fisher displays his first boat along with his 6-year-old son, Cory, and 4-year-old son, Chad. Don't let the calm water fool you, whenever we run our boats, the wind starts increasing and the water turns rough. Mike's AC Magnum hull loves rough water.



Mike Fisher's AC Magnum deep vee uses an OPS .45, Marine Specialties engine mount, Westcoast Racing Products cable drive, and an AC Magnum fiberglass radio box. This hull is easy to finish and trim out.

continued on page 64

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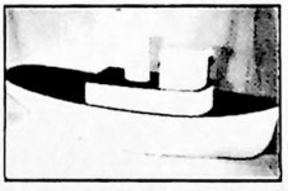
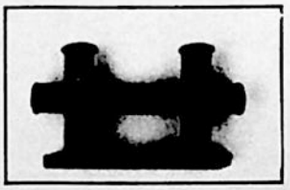


CAROL MORAN Tug—53"

SPORTS FISHER-MAN 45" Hull



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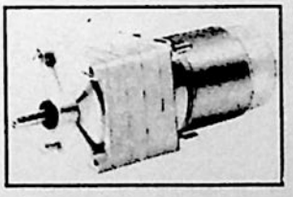

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VISA

BY JERRY DUNLAP

PLEASE PUT ON YOUR PFD BEFORE GOING OUT

You wouldn't think of going out to the pond to run your model boat without putting on your BVDs. And you shouldn't be out on the pond getting your boat without wearing your PFD. PFD is the acronym for Personal Flotation Device and that's the fancy term for life jacket. A potentially life-threatening event I recently witnessed really brought home the importance of wearing a PFD.

After our first APBA District 8 in Longview, Washington, a new model boater was running his 3.5 outboard tunnel while we were loading up our club equipment and models. His model stopped running, out in the middle of the pond, and as he prepared to use our club retrieve boat, I requested he put on a life jacket. He did, and rowed out and picked up his boat.

As we still didn't have all our models and equipment packed up, I suggested he restart his boat and make another run. I continued placing my

Paul with his first First Place trophy won in October of 1979 at Lake Waughop, Tacoma. Boat is a cut down version of the Dumas wood Deep Vee 40 kit.

Paul with John Brodbeck, Sr., of K&B Manufacturing, at the 1980 NAMBA Nationals at Lake Waughop, Tacoma.

Jerry with his Dumas ABS Hotshot Sprint 3.5 after establishing a new APBA speed record of 52.941 in 3.5 Mod Tunnel. Jerry used an Octura X-640 propeller and Power Master 65% Pylon Fuel.

Paul Dunlap (l) with Ron Erickson after Paul's first race at Olympia in July of 1979. Paul won the APBA 3.5 Mod Tunnel National Championship at the same site in July of 1990.

models in my pickup as he restarted and ran again. A short time later, I noticed his boat wasn't running and glanced out on the water. The sight of a person in the water struggling to crawl back into the rowboat was indeed frightening to behold. Fortunately, our new model boater was wearing the PFD provided him. He managed to get back into our club rowboat (which has built-in flotation), bail it out, and row back to shore.

Our new model boater arrived back at the launching area thoroughly drenched, shaking from the cold water, and slightly embarrassed. However, the most important thing is, he did arrive back at the launching pad still breathing. The PFD did its job, our club has a new member, and I for one became a believer in PFDs. Even though our new member told us he could swim, being unexpectedly dumped fully clothed into cold water while wearing ankle high wading boots can place a severe strain on anyone's ability to stay afloat. The cost of a PFD is certainly less expensive than the cost of someone's life lost through a drowning.

MORE 'SPRINTING' AROUND

In the Spring 1991 issue, I did a review of the ABS Plastic Hotshot Sprint 3.5 from Dumas Boats. Because I had the boat just a short time before submitting the review, I only had an opportunity to run it twice. I mentioned in the article I was very pleased with the performance and handling of the boat after just minimal running time.

Since that article was submitted, I've had much more time to run the ABS Plastic Hotshot Sprint 3.5 and can now state I'm more than just pleased with the performance and handling of this boat . . . I'm downright exultant. Although that may seem like a pretty high opinion on a product I designed, let me explain the basis for this feeling.

On the last Saturday in March, I ran the ABS Sprint 3.5 at a straightaway speed records event conducted near Marysville, Washington. Running a modified (intake carb with exhaust throttle) 3.5 K&B Outboard, 65% Power Master Pylon Racing Fuel, and an Octura X-640 propeller, the boat established a new APBA speed record of 52.941 in 3.5 Mod OPC Tunnel class. The boat had several one-way passes over 54 mph, but wind and choppy water conditions prevented me from backing up those runs. In order to establish a speed record, two consecutive passes in each direction must be made.

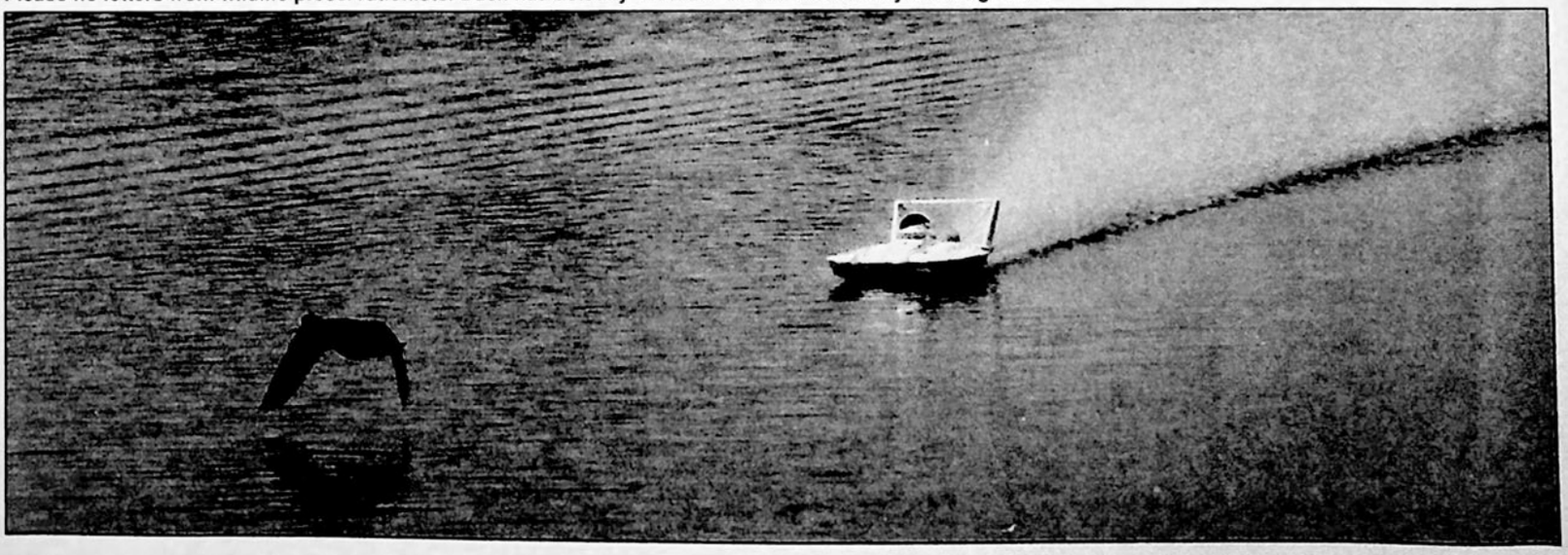
The ABS Sprint 3.5 proved it was capable of running fast, but how would it work in racing situations? I found out the answer to that question in mid-May when I entered the boat for the first time in heat race competition. I set the boat up with a stock 3.5 K&B Outboard and installed an Octura X-337/3 propeller. My first set of heats was against other 3.5 tunnels, mostly wooden versions of the Sprint 3.5, and I easily outdistanced these boats in six-lap heat racing. Then just for fun, I entered the ABS Sprint 3.5 in the 7.5 tunnel class. Until a faulty receiver prevented running in the final two heats, I was the points leader after two heats!

At the District 8 Can-Am Challenge Race, held at Harrison Lake, British Columbia on May 25, I had my first opportunity to race on a measured six-lap mile record course. In two races, I ran heat times of 1:52

Paul drove the 11cc scale unlimited version of the 1982 "Executone" to victory in the 1990 Spokane Diamond Cup.

Paul refills the Geraghty Tunnel he used to win 3rd place in 3.5 Mod Tunnel at the 1989 APBA Nationals at Riverland, CA. Paul won 1989 Junior High Point Award at this event.

Rick Campbell's "Circus Circus" about to overtake a low flying duck at the 1991 R/C Unlimited World's Championship Regatta at Marysville, Washington. Please no letters from wildlife preservationists. Duck had actually "buzzed" the boat! Photo by Jim Auguston.



for six laps and was only one second off the record. In both of those heats, I had to run wide in one of the corners to avoid boats that had quit running. I have no doubt the ABS Sprint 3.5 is capable of breaking the six-lap, one-mile oval competition record if we can just get the right water conditions and an unobstructed race course.

Here are the things I've done with my ABS Sprint 3.5 that weren't covered in the review in our Spring issue:

1. Use a 707 Products or Prather Products K&B 3.5 engine modification kit for running a modified motor.

2. For sport running and racing, use an Octura 437/3 propeller.

3. For top speed, use an Octura X-640.

4. Attach four ounces of lead to the inside front of the cowling. Be sure you add extra foam to keep the cowling afloat.

I recently received the kit version of the Dumas ABC Hotshot Sprint 3.5 and it's really very complete. In my review of the boat, I stated the linkages would be factory installed. Well, I made a wrong assumption on that feature. The linkages were installed on the boat I picked up, because it was a display boat. However, it doesn't take very long to drill the necessary holes in the back of the radio compartment and install the linkages.

THOUGHTS ABOUT A GRADUATE

By the time this article is published and distributed, my son and racing partner for the past twelve years will have graduated from high school. If things go according to plan, come October, Paul Dunlap will be around boats a little bigger than those he has been racing for the past dozen years. Paul has decided to join the Coast Guard. If he can qualify, Paul would like to pilot a small Coast Guard patrol boat.

It will definitely be a different feeling for me to go to the boat races without Paul. Although he never really developed an interest in building model boats, Paul developed a terrific ability to race model boats. He has won races in everything from 3.5 deep vee to 11cc scale hydroplane; he has won numerous District 8 Championships, established national competition records, National Junior High Point Award, and last year won his first National Championship in 3.5 Mod Tunnel.

Over the years, Paul has been very helpful in my efforts to review model boats. Since a very early age, he has driven boats while I took the running photos. Paul took a photography class during his sophomore year in high school. Many of the action shots in my reviews during the past three years were snapped by Paul.

I still remember Paul's very first boat race. It was the summer between his kindergarten and first grade at school. We were racing at Olympia on the same lake he would win his first National Championship some eleven years later. I had cut down a Dumas wood kit Deep Vee 40 to make a 3.5 deep vee. The boat really ran very well and I had won races with it. Paul had been driving model boats since he was about three years old, so he knew how to drive and throttle the boat.

In his first heat, he raced Ron Erickson, a well-known Northwest model boater. Going into the first turn, Paul was outside of Ron and then cut Ron off at the corner. Paul missed a buoy in that first corner and ended up having to run an extra lap. But I guess he served notice early that he was going to be a competitive model boat racer.

Using that same 3.5 deep vee, Paul was in excellent position to finish in the top five in the 3.5 monoplane class at the 1980 NAMBA Nationals. In his fourth and final heat of the event, he was leading the second place boat by half a length when the boat stopped on the backstretch of the final lap. After retrieving the boat, I noticed it was completely out of fuel. Seems like I had forgotten to refill the boat after the last heat. I think Paul began doing his own refueling shortly after that incident!

The summer of 1990 was a special year in our model boating experiences. At the 1990 APBA Nationals in Olympia, Paul drove a 3.5 Mod Tunnel I had designed and built, to first place. I placed second in the same class, driving the same boat.

During August we finally got our 11cc scale hydroplane, the 1982 "Executone," really working well. Paul came within a blown exhaust coupler of winning a spot in the final heat of the 1990 Mini Gold Cup held

continued on page 56

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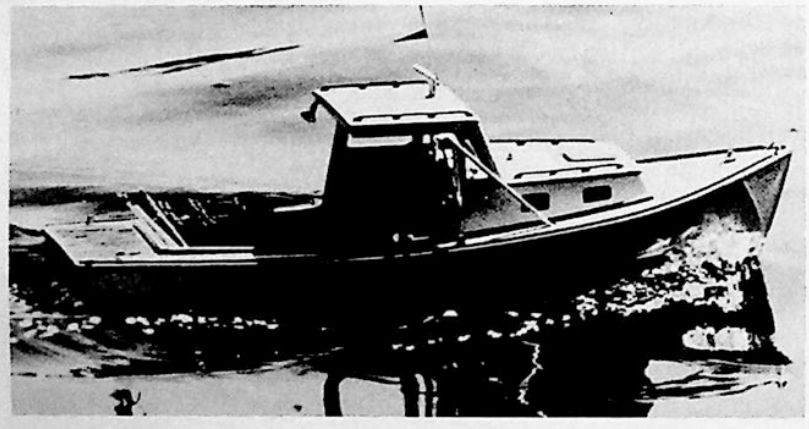

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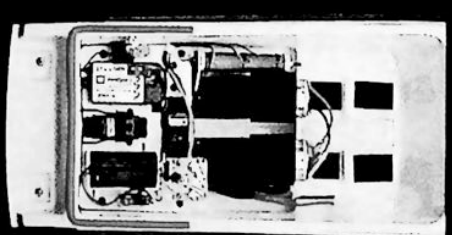

This beautiful hull couldn't carry the VILLAIN IV name without powerful performance. Dual motors supply twice the thrust. Twin outdrives double the cornering excitement. Dual battery packs, wired in parallel, add twice the run time.

TWEAKER'S DELIGHT

The 2:1 gear ratio is adjustable higher or lower for perfect matching of motor power and prop size. Ample room has been provided for larger aftermarket screw-on props. The trim angle can also be altered to get the performance and look "just right."

SPECIFICATIONS	
HULL	"Deep V" Offshore racing
WEIGHT	3.5 lbs. (w/o batteries)
LENGTH	31" Overall
BEAM	8.25" Overall
DRAFT	4.5"
DEAD RISE ANGLE	22 Degrees
MOTORS	Twin RS-540S With Aluminum Heat Sinks
DRIVE SYSTEM	Adjustable 2:1 gear Steerable Outdrives Counter-rotating Props
OILING SYSTEM	Built-in
PROPELLERS	Surface Piercing
TRIM ANGLE	Adjustable
SPEED CONTROL	Model 1501 - 4 Step FWD/REV Mech. Model 1502 - FWD/REV Electronics
RADIO	2-CH w/Servo Reverse
BATTERIES	(1) or (2) 6-Cell
STAND	Mahogany (included)
APPROX. RUN TIME	8-12 Min. (2) 6-Cell 4-6 Min. (1) 6-Cell

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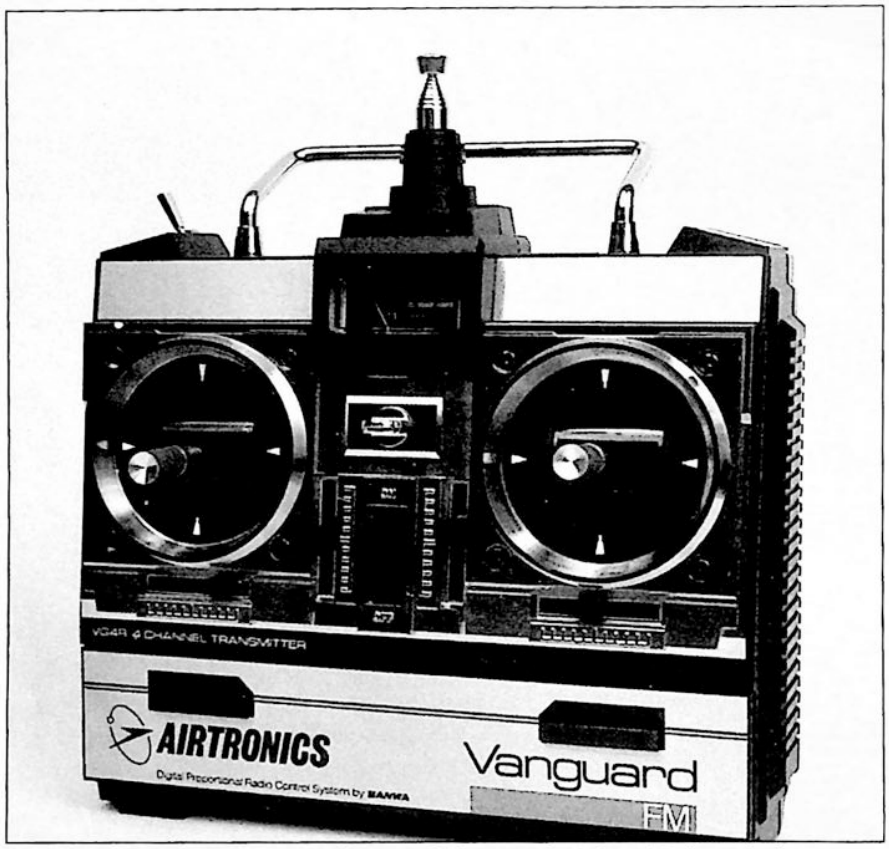
26 MPH achieved by Villian IV modified with inexpensive readily-a... speed accessories. Contact Traxxas or your hobby shop for detail...

whatever channel you wish to use, and the splicing in of three other wires from the keypad assembly. This installation is well described and illustrated in the instructions, and should present no problem at all unless you are the type who insists that the only tools worth owning are a blowtorch and a hatchet!

There is one "however" which I must mention . . . transmitters with separate trim pots. For those of you unfamiliar with the insides of your transmitter, allow me to explain. In some transmitters, the trim function on each channel, as made with a separate lever, is done mechanically; the main pot body is rotated as the lever is actuated. In others, there is a completely separate pot used, wired to but completely isolated physically from the main channel pot. In operation, the effect is the same, but that second pot has to be considered in the installation of a device such as the JM-112(A). For the single-pot transmitter, simply splice in the wires as mentioned and detailed by JEM. However, the second trim pot, if used, will still be in the circuit and if its lever were moved, would have an effect on the calibration and operation of the JM-112(A) system. Thus it must be disabled, which is actually easier done than said! All that is required, after you identify it, is to remove and insulate the center of the three wires connected in a manner similar to the main control pot. I'm sure I don't have to locate the trim pot for you; in case of doubt refer to the transmitter instruction manual!

The procedure described by JEM will also apply if you prefer to add the keypad to a lever or knob-operated auxiliary channel. However, yet another possibility exists . . . that of adding it to the switch-operated fifth or "retract gear" channel. In use, instead of the variable resistance of the pot, the switch selects resistors of fixed values. These resistors must be identified and removed or bypassed, and can't be detailed here as it is a different operation for different transmitters. However, if you plan to install a JM-112(A) and wish to do so in the retract channel, drop a line and let me know what in, I'll try to walk you through the operation in your particular system.



The popular and modern Airtronics Vanguard RC system, in 4, 6, and 7 channels, is now available on all 75 MHz frequencies, the ones legal for non-flying (surface) models.

In that respect, there is a caution worth mentioning . . . though the JEM-112 will work in all modern IC encoder equipped transmitters, it might not work with some of the older all-transistor encoders. I won't bore you with all the technical details as to why not, just accept the fact that if you are still holding on to that old relic, you are out of step and are also probably the reason for those unexplained control problems others at the pond are experiencing.

Wanna hear something interesting? Well, the JM-112 is an extremely sophisticated system, even to the use of a Motorola microprocessor in the decoder! However, inside the keypad control is exactly what I detailed in my original treatise on the subject . . . a string of resistors which are selected as the keys are punched, exactly as I described. Obviously, modern manufacturing techniques make possible mechanical and operational advantages superior to what us tinkerers can do with off-the-shelf parts, but the principle involved is the same.

The Airtronics Vanguard, a four-channel system used for all this testing, first had the keypad connected in place of the left hand horizontal stick operation, as recommended in the JEM instructions. This is a separate trim pot transmitter, and required the removal of the additional wire as already described. Following that, I (quite cleverly!) figured out how to leave all four channels intact and usable, and connected in to what would have been the fifth channel had it been used. While not exactly difficult, this operation is definitely not for the blowtorch crowd and I will reserve the details on how it can be done for those who need and request them. The same goes if you acquire either a six or seven-channel Vanguard, and wish to use one of those channels for the keypad.

As seen in the photograph, I opted to mount the keypad on the upper right corner of the transmitter, a simple chore using double-sided mounting tape. In this case, I routed the wiring into the transmitter through one of two existing holes on the top corner of the case, holes that are there for switches in those transmitters with more channels and more controls. In this case, they are covered only by the chrome label which can be easily cut with an Uber Skiver hobby knife. These holes become plainly visible once the rear cover is removed. Obviously, the keypad can be mounted anywhere; there is a similar hole on the upper left side if you prefer. It could also be mounted along the bottom, though on this particular transmitter there is a door that opens for access to the servo reversing switches and some provisions would have to be made for the entering and routing of the wiring. It's really a matter of personal choice and operating techniques and there are no critical technical requirements to speak of.

Now for the JM-112(A) decoder. It needs only to be plugged in to the appropriate receiver channel and was originally available with either Futaba "J" or the older right angled Futaba "G" connectors. In place of the "J" connector, newer versions come equipped with a universal fitting usable with Airtronics, Futaba, and "other FM radios." My particular JEM-112 arrived with a "J" harness and my testing with the Vanguard required the installation of the proper connector, which brings up another interesting and quite clever product you should know about:

The Novak Input Plug System. This is a wiring system designed to connect the item of your choice to the receiver, just like so many others. However, there is a definite difference in this one; it comes with a variety of plastic ends into which the connectors are inserted, providing both the correct fool proof physical configuration and properly polarized connections. It comes with correct fittings for all RC systems in general use; Airtronics, Futaba J, KO, Kyosho, and JR. As I was using the decoder with an Airtronics receiver, the first step was to replace the original Futaba J harness with appropriately terminated Novak wiring. This brought another improvement, that of mechanical flexibility, as I have always found Futaba harnesses too stiff and somewhat difficult to route as I like. The Novak Input Plug System is most easily found in hobby shops that cater to the RC car enthusiast.

Connecting whatever auxiliary equipment to be operated by the JM-112(A) is now as simple as connecting a switch or relay, and the instructions are quite clear and concise in that respect. Effectively, a ground is run from the battery to the JM-112(A), with individual grounds to each circuit to be controlled. A simple calibration procedure is required the first time it is used with a specific transmitter. Though JEM claims that said calibration takes only 30 seconds, you'd best be prepared to take some 3 to 4 minutes the first time around so as to get it right. If, however, you do goof it, no harm, you just do it again!

Current-wise, the JM-112(A) is rated at five amps per output. It measures 3 x 4 inches, and weighs 3.4 ounces. It uses modern circuitry and construction techniques, including the microprocessor mentioned earlier, four other ICs, MOSFETs, and optocouplers between the control and output circuitry for the elimination of any electrical noise generated by whatever is being controlled. The warranty period which includes parts and labor, is for one year.

Cost? The complete JM-112(A), keypad and decoder is priced at $129.95 Canadian, $119.95 US. Additional decoders, for operating that second boat with the same transmitter, are available at $104.95 and $94.95 respectively. There is also a discount for club orders of five or more systems. JEM RC Electronics Research can be reached at: Box #28003, Crystal Beach P.O., Nepean, Ontario, Canada K2H 9R7; (613) 253-0204 after 6pm EST. If a machine answers, leave a message for a return call.

There are a couple of cautions that I must mention in the use of either the Switch 4 or the JM-112(A). One is that neatness counts in the installation, and will pay off in reliability and efficiency. I know that many of you have extensive electronic experience, but there are also a lot of you who are better surgeons, pilots, or programmers. If you have any doubts about anything having to do with the installation, ask for help. Ask your friends, if they are in the experienced class, ask the maker of the unit of your choice, or ask me . . . we'll all try to help you.

Also, both of these decoder units come less a case; and electronic equipment does not like water. There is no end of plastic cases around into which your water-borne decoder could be placed and protected. If nothing else, stick the thing in a heavy plastic bag and seal the end!

In that respect, electronics also doesn't like the hardware store type of RTV (How many of you know what that means?) silicone, the one that smells like vinegar. It gives off corrosive fumes that will dull and damage solder and copper. Much better for any sealing chores is a product called "Shoe Goo." It is intended for repair of athletic shoes, and is available in shoe stores, drug stores, etc. It looks and acts like silicone, but is noncorrosive, and as an added bonus, peals off clean when and if you ever have to remove it

See how informative reading *USB&SM* and "Radio Waves" can be? . . . This month you not only learned how to turn your sirens, pumps and whistles on reliably, but also how to repair your Nikes!

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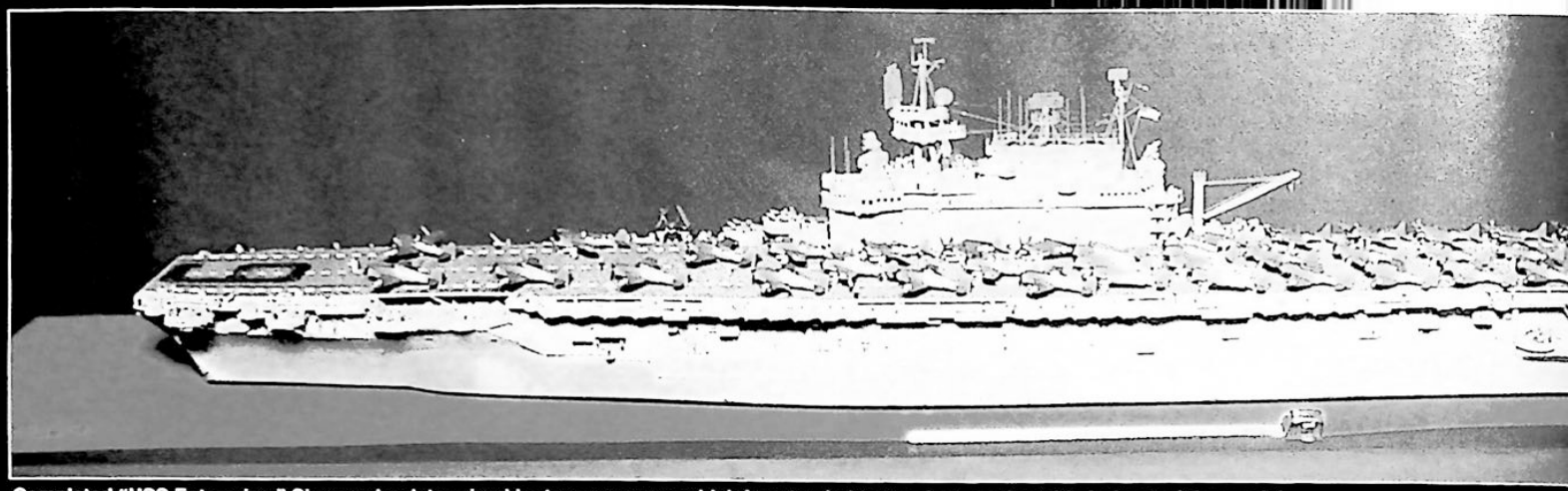
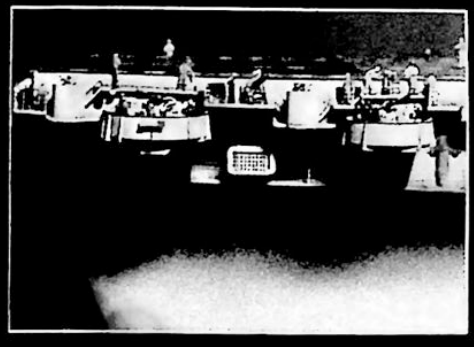
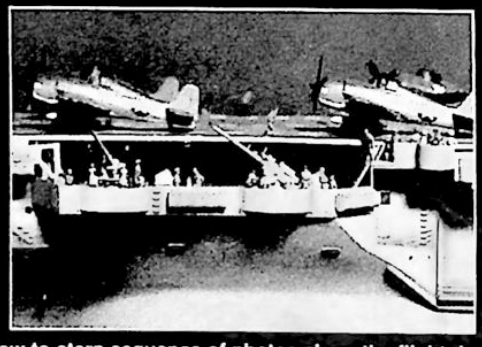


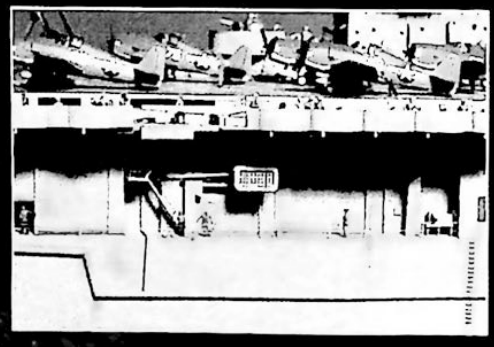
Completed "USS Enterprise." Size can be determined by tape measure, which is extended to two feet, on the table in front of the model.

PROJECT ENTERPRISE UPDATE

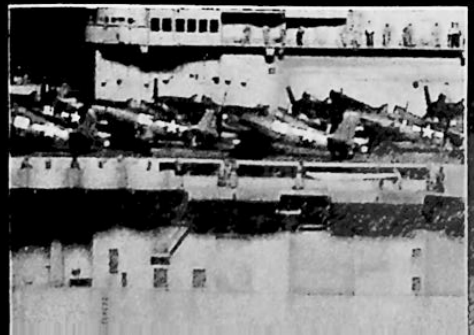
BY SCOTTIE DAYTON

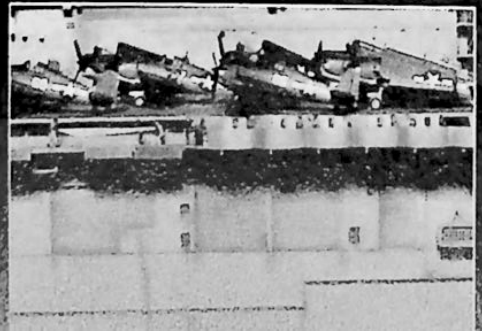


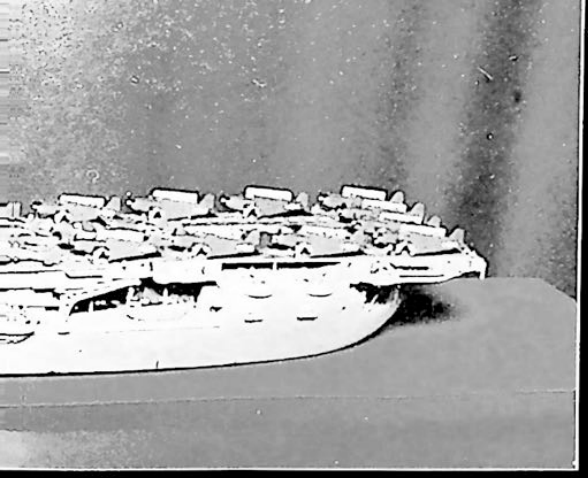




Bow-to-stern sequence of photos along the flight deck.





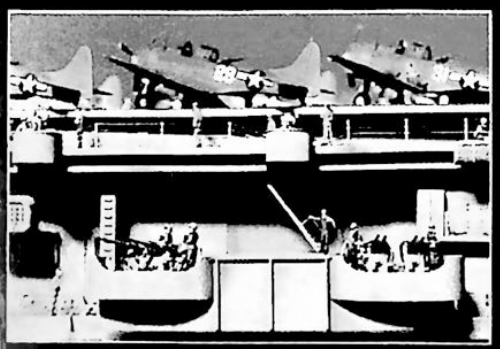


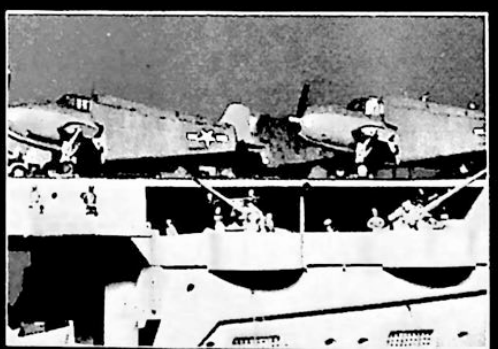
November 2, 1990 was a red-letter day for the EAA Air Adventure Museum in Oshkosh, Wisconsin. That evening, the 11-1/2 foot long, 1:72 scale waterline model of *USS Enterprise* (CV-6) was officially unveiled in Eagle Hangar. Almost all of the modelers involved in "Project Enterprise" were in attendance, enjoying their first opportunity to meet one another face to face. Over wine and cheese they discussed their failures and successes. Abundant laughter filled the 44,000-square foot hall as disasters were recounted in a much lighter vein than when they had occurred.

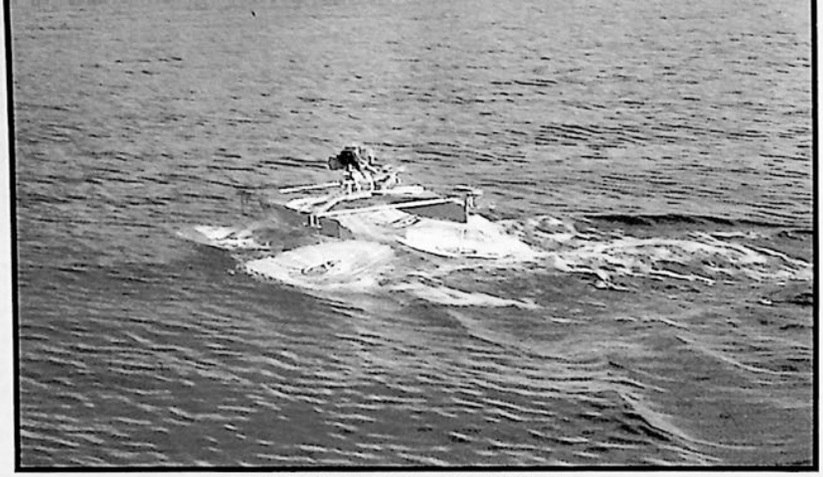
Even Jack Streeper, who had experienced the greatest catastrophe in July, was in high spirits. Forty miles from the EAA, while transporting the ship's island from his home in Fairfax, Virginia, Streeper lost control of his vehicle, hit a gaurdrail and rolled the Bronco, totaling it. The island, riding in a wooden crate, turned upside down and fell at least three feet. Streeper, wearing his safety belts, escaped from the compressed cab through the broken windshield. Amazingly, he suffered only a fractured rib. The island wasn't as fortunate. Its masts, gun directors, and 5-inch guns were broken, antennae damaged, and the access

continued on page 55

Enlargement of the island area of the "Big E" model.



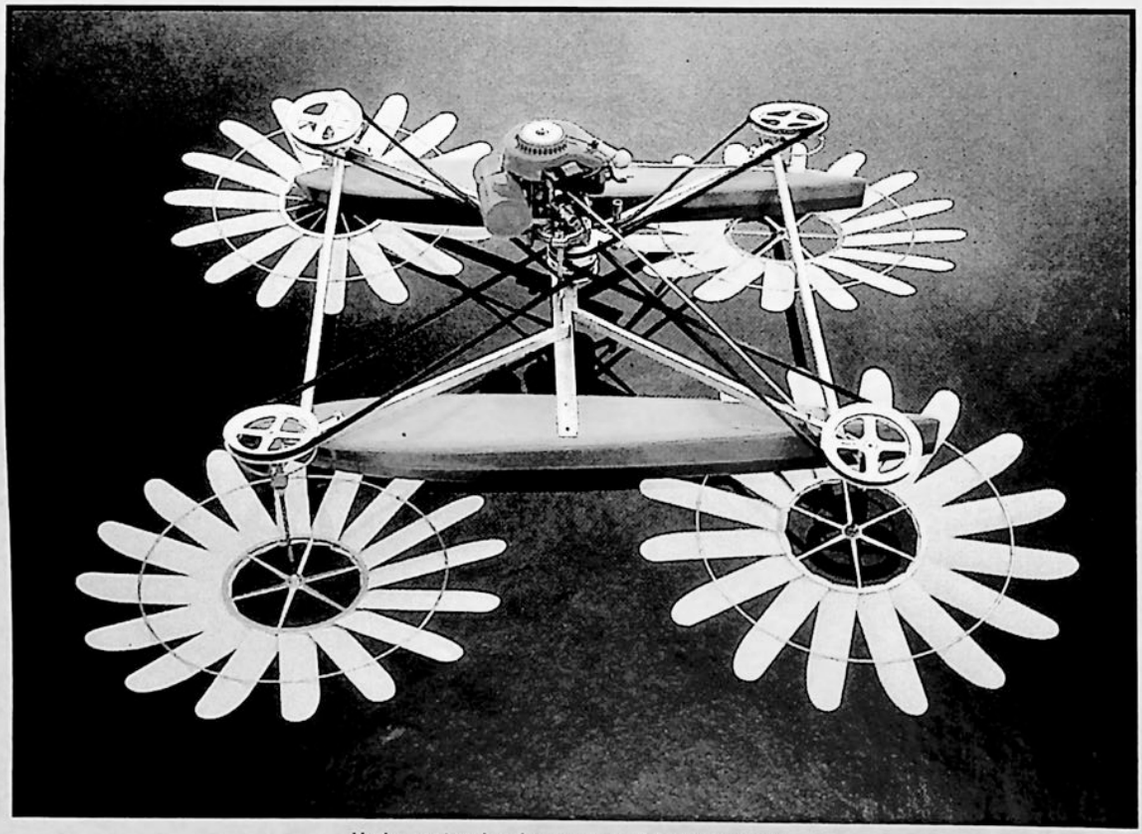




RC hydrocopter model underway.

THE HYDROCOPTER

BY FRANCIS REYNOLDS



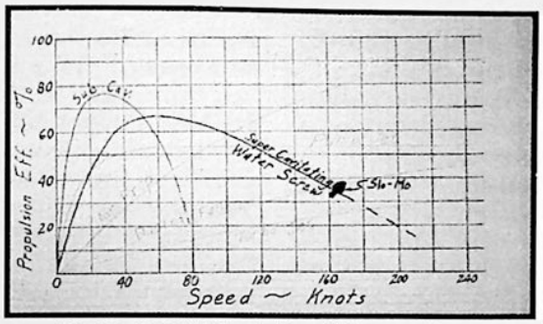
Hydrocopter development model number four.

The story of a workable, but commercially unsuccessful, marine vehicle invention, which was developed through the use of models. It looks a bit like a hovercraft, a bit like a hydrofoil boat, and a lot like an upside-down four-rotor helicopter, but its unique operating principle is different from any of these. Francis Reynolds, the inventor, is an engineer. He is the author of the "Model Design & Technical Stuff" column for our sister magazine, Model Builder *(Airplane). Francis has written a number of RC sailboat articles for* U.S. Boat & Ship Modeler, *and also the story of the Fireboat Alki model, which appeared in the Summer '91 issue.*

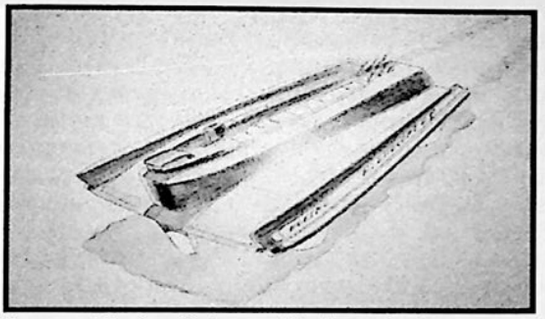
IN THE BEGINNING

In the summer of 1960, I was watching the "Gold Cup" Unlimited Hydroplane Race on Lake Washington at Seattle, and started wondering how still faster boats might be designed. I idly thought, "Why not put wheels on a boat and run it on top of the water as though it was on land." This isn't as ridiculous as it may sound, as at high speeds, water acts surprisingly solid. If you doubt that, try a belly flop from twenty or thirty feet!

Even though wheels could provide planing lift at sufficiently high speeds, I realized that smooth wheels couldn't get enough traction on the



Curves show high relative efficiency of hydrocopter propulsion.



Proposed Boeing high-speed hydrocopter ferry.

water to drive the "boat." "Hydroplaning" automobiles skid.

Next I wondered about putting cleats of some kind around the rims of the wheels. These could push the water back and provide propulsion, much as stern wheels or side wheels did on old time steamers.

About that time the cartoonist's light bulb turned on over my head. I realized that what I was visualizing was a unique type of hydrofoil boat where the foils provided both the lift and the thrust or propulsion; and this thrust was free, because it was the unavoidable drag of the foils. Have I lost some of you? O.K., let's take it step by step.

In a conventional hydrofoil boat, the foils are attached to the hull. When the boat is propelled at sufficiently high speed, the foils generate enough lift to raise the hull out of the water. This is good, as the drag of the foils is a lot less than the resistance of the hull would be at high speeds.

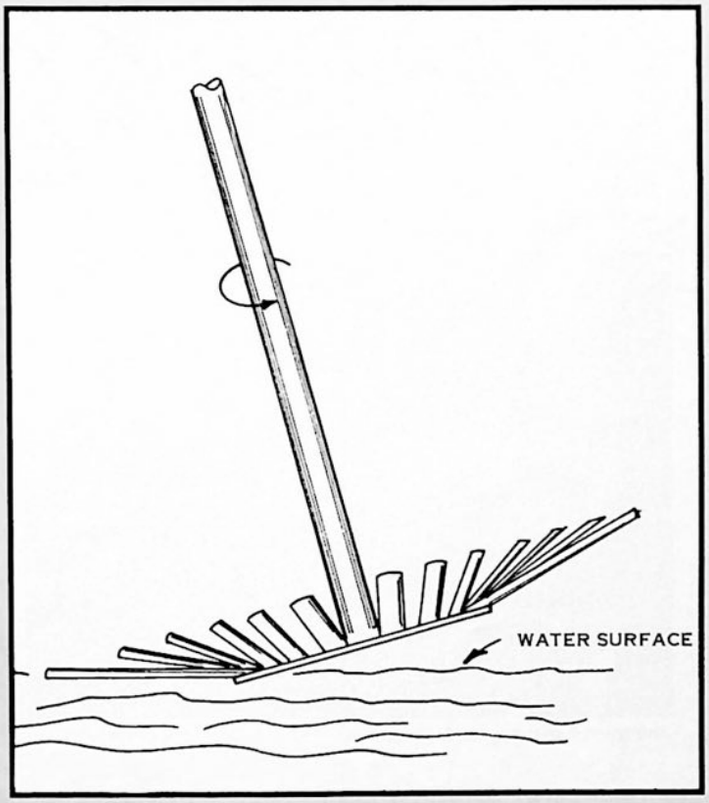
In conventional hydrofoil boats, thrust must be generated, by some kind of a propulsion system, to provide acceleration and to overcome hydrofoil drag and aerodynamic drag. The foils move forward on the water, so their drag is aft, naturally.

On my invention, however, the foils are attached to the rims of the wheels. The wheels are turning, and slipping some on the water, so these hydrofoils are moving aft with respect to the water and therefore their drag is forward! In terms of the vehicle as a whole, a forward force is a thrust, not a drag. As the foils on the wheels are the only thing contacting the water, there is no vehicle hydrodynamic drag, only thrust. With no drag from the water, we need only enough thrust to accelerate and to overcome aerodynamic drag. At this point my enthusiasm was at the "By George, I've got it" stage.

Also, about that time, I was casually watching Mallards and Coots taking off from a lake. They didn't make vertical takeoffs, they ran on the surface of the water to build up flying speed. "Running" on the water? Yes. I concluded their webbed feet were acting as hydrofoils, which were providing lift to support body weight, and the foil drag was turned around into thrust for the takeoff run. When a webbed foot reached the end of a working stroke, it returned to the beginning of another working stroke through the air, the same as the hydrofoils I proposed to put on wheels. So I didn't invent the concept, nature did.

I don't remember now which came first, the chicke—no, the duck or the hydrofoil wheel, into my mind. It was close to the same time, and both lines of observation contributed to the insights of the inventive process.

Needless to say, I didn't quickly build a full-scale machine and win the 1961 Gold Cup Race, or win anything with the idea for that matter, except a patent and some knowledge. I spent a few thousand challenging hours, over several years, in engineering, designing and building test models, conducting tests and evaluating the data.



Side view of a planing hydrocopter. See text.

Patent search results are usually enlightening; this one was no exception. Most inventors are so impressed with their latest idea that it is next to impossible for them to believe that anyone could have had that idea before them. I was guilty of that unrealistic thinking, even though I was, by then, an experienced inventor with a few patents.

So I expected the search would yield few, if any, "prior art" patents. Actually, about two dozen similar patents were found. The dates on some of these patents contributed to my letdown. It was anything but a new idea. Several of the patents were granted in the 1800s.

I was pleased, however, to discover that not all the prior patents were granted to "crackpot" inventors. One of them was awarded to Alexander Graham Bell. Some of you may be aware that Bell was interested in more than the telephone. He also experimented with kites, airplanes, and boats. He held a 70-mph speed record for hydrofoil boats in 1919. In his thinking about hydrofoils he had also conceived of the same hydrofoils-on-wheels concept that I reinvented about fifty years later.

It was obvious from their patents that most of the previous inventors had little or no technical education. Further, as my work was done later,

I had the advantage of a much more advanced technology base to work from. As a result, my patent, No. 3,125,981, carried the concept further than the others, and was more technical in nature. I was granted nineteen claims in a fairly strong patent. It was issued in 1964, and has since expired; as United States patents are effective for only seventeen years.

CONFIGURATIONS

To this point, I have talked about hydrofoils mounted on wheels, but if you have been peeking at the photos you have seen some things that look more like helicopter rotors. I started with the wheels concept; designed, built and tested some hardware, and it was workable, but it had some serious disadvantages.

To get enough lifting area into hydrofoils of reasonable aspect ratio, and to keep the action of the foils on the water reasonably linear, I had to make the wheels both wide and large in diameter. They therefore had high aerodynamic drag and the further disadvantages of being heavy and expensive. Also, as this had to be a four-wheel drive vehicle, steering was not a simple problem.

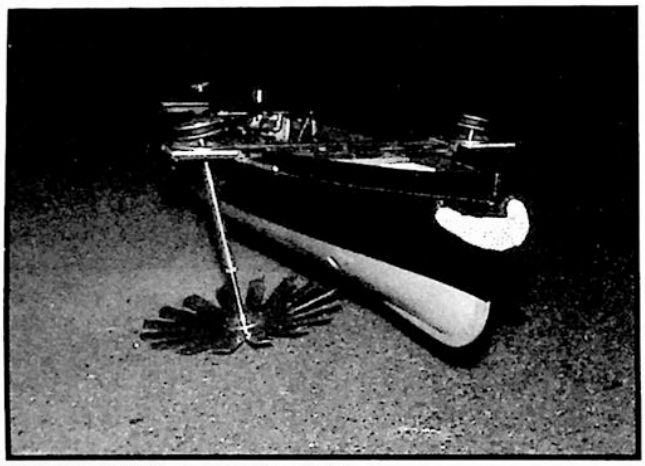
So back to the think tank, the slide rule (in those days), and the drawing board. The outcome was the helicopter-rotor-like version. This retained the concept of hydrofoil lift and free thrust from the hydrofoil drag, but the "liftout" was much improved, the aerodynamic drag was greatly reduced, and the steering (controllability) was fantastic. More on that in a minute.

It is time to talk about another aspect of the basic concept. The photos and sketches show the wheels or rotors to be mostly out of the water while they are working. This is essential. This concept works only at the surface; at the interface between the air and the water. What we are doing is moving hydrofoils aft on the surface for a short distance, then returning them through the air, to the beginning of their short working strokes.

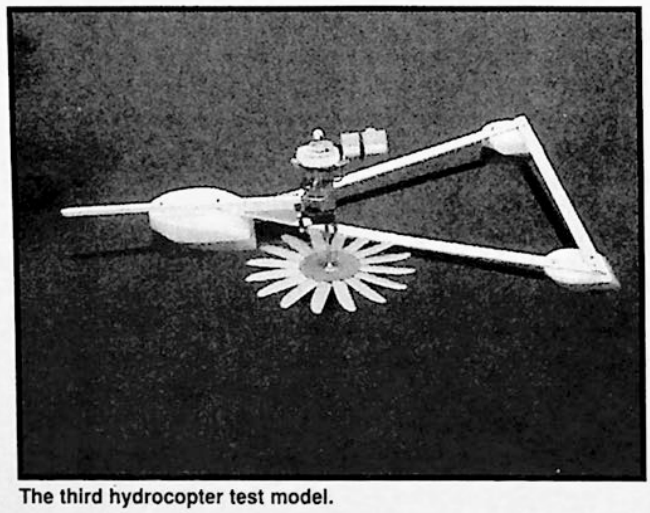
Water is 813 times as dense as air, so the aerodynamic forces on the returning hydrofoils (let's call them blades) are almost negligible compared to the forces on them while they are in contact with the water.

The helicopter-like version has to have its rotor shafts tilted, as shown, so the lowest blades can do their lift and thrust job on the surface, then they rise clear of the surface to return to the working area again.

We steer by changing the orientation of one or more of the tilted rotor shafts. The blades in contact with the water at any one time are within a small arc, are moving in a particular direction, and are generating thrust in the opposite direction. If, without changing the rotation, we "nutate" the tilted shaft 180 degrees so the blades in contact with the water are on the other side of the rotor circle, we have reversed the thrust from that rotor.



The second hydrocopter test model.



The third hydrocopter test model.

We can nutate the front rotors a few degrees for front-wheel steering. We can steer with the rear rotors instead, if we want. If we have control of the tilt orientation of all four rotors, we can do interesting things like stand in one spot and spin the machine about its center; or oppose pairs of rotors to cancel out their thrust, so we sit still and hover on top of the water. We could also go full speed astern or full speed sideways. This helicopter-like maneuverability plus the helicopter-like rotors led me to name the invention the "Hydrocopter." The rotors are called "Hydrorotors" in the patent.

DEVELOPMENT TESTS

Most basic inventions fail to work the first few times they are tried. Murphy assures us of that. The hydrocopter was no exception. The first two models I built didn't work at all, and the third model worked only slightly. It is easy to design a conventional boat and know it will work, because we copy features and proportions from other boats that already work. Designing the first hydrocopter wasn't easy because there was nothing to copy and no tables of hydrocopter data in the engineering handbooks.

The ducks were a little help, but it is difficult to get close enough to a duck in its takeoff run to acquire accurate technical data. The ducks weren't uncooperative, you understand, just unaware of my need to study their modus operandi.

The most important developmental tests were those which were conducted to get basic engineering data on hydrorotors, not on complete vehicles. Some of these tests were conducted in shallow water with a central pylon and a boom which would swing around it. The hydrorotor to be tested, and the motor to drive it, were mounted on the outer end of the boom, along with instrumentation to measure lift, thrust, rpm, torque, and input power. This configuration was much like control line model flying, or the old tethered model hydroplane racing.

I got the most useful technical hydrorotor design data from rotor tests conducted from an outboard water ski boat, however. As you can see from the photo, the test rotor was mounted on the end of an arm that extended over one side of the boat. The arm assembly was welded up of steel, and consisted of a parallelogram linkage that permitted the boat to heel without lifting or submerging the hydrorotor.

Note the vertical sheet between the boat and the test rotor. This was a plywood "bow wave trap," which intercepted the wave from the test boat and deflected it away from the rotor test area so the testing took place in undisturbed water.

The rotor was powered by an electric motor, which in turn received energy from an automobile storage

battery in the boat. A small tachometer generator was mounted on the end of the rotor motor. The output from this generator was measured on a meter which was calibrated in rpm.

Actually, the rotor "motor" started out in life as a DC automobile generator, and the tachometer "generator" was built as a DC motor. Inventors will use anything they can to get the job done, regardless of what the labels say. Other cases of this type were the nylon model airplane propellers which were used for blades on some of the rotors, and the cambered steel venetian-blind stock which was used to make blades for other hydrorotors.

I had previously run dynamometer tests on the rotor drive motor, so I knew what horsepower it put out under different operating conditions. Two meters in the boat measured voltage and current to the motor. A spring scale on an arm measured rotor torque. Another scale measured thrust, and a beam balance on the main arm measured rotor lift.

This rotor test rig was used to test both the original hydrowheels and the later hydrorotors. It yielded a lot of good data, which was reduced and engineering curves were developed. The real goal was an operating vehicle, however, not just a pile of technical data.

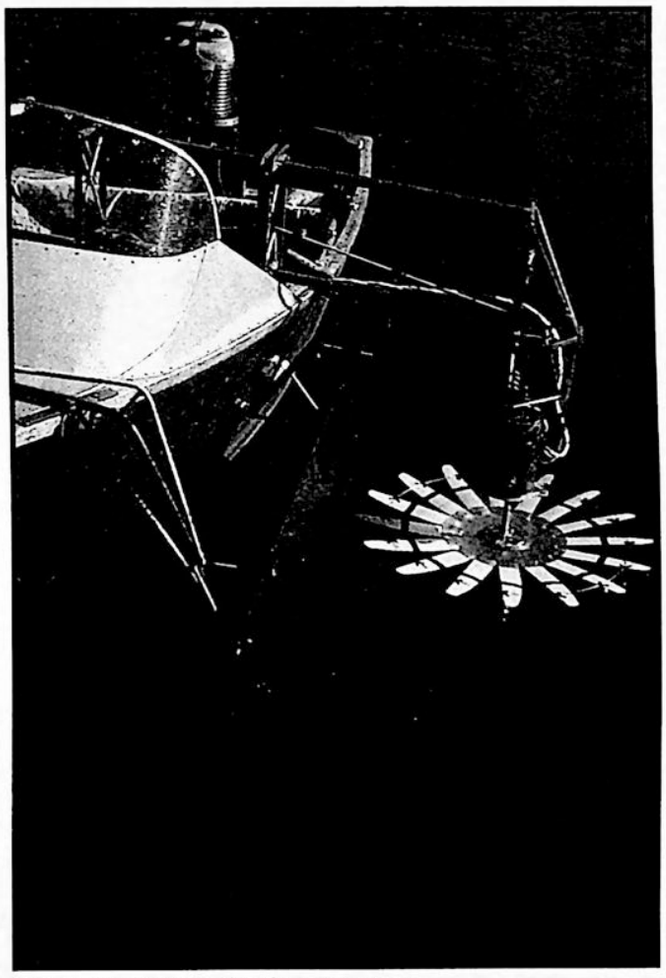
SCALE MODEL DEVELOPMENT

A full-scale hydrocopter would have cost a lot of money and taken a long time to develop, but even if it had been cheap and easy, I would have gone the model test route anyway. In development work, things always go wrong. If they didn't the word "development" would be meaningless. It is far cheaper, easier and faster, and sometimes safer, to run a series of tests on models than it is full scale. Models can be altered in design and rebuilt much more readily. I have used RC scale models in developing several inventions, and highly recommend the procedure.

The first several developmental models were free running (or would have been if they had worked). Model number four was equipped with simple radio control, so it could be timed through a measured course, and otherwise managed in tests.

There was a need for engineering data on the performance of the complete models. Speed I could measure with a stopwatch and a run between two docks a known distance apart. But I also needed to know the rpm of the hydrorotors. Rotor speed was easy to get when the rotor was on the ski boat rig, but how could I measure rotor rpm when the model was out in the lake and I was on shore?

One could have put a tachometer on the model, transmitted the data from it by radio, and received and decoded it on shore. Such "telemetry" is common in guided missile and satellite test work, but it would have cost me time and bucks.



Hydrocopter test rig. Note bow wave trap.

Inventors sometimes end up making secondary inventions to aid them in the development of their primary invention. It happened here. It suddenly occurred to me that rpm data was already being transmitted to shore. All I had to do was make use of it.

I'm referring to the fact that I was driving the developmental model with a single-cylinder two-stroke internal combustion engine, and I could hear its exhaust sound from shore. If I could measure the frequency of that sound in cycles per second I could multiply by 60 and get the engine rpm. Since I knew the ratio of the transmission, I could then also calculate rotor rpm.

Doing this turned out to be simple. My "Sonotach" consists of a homebuilt precision audio oscillator and a pair of earphones. While hearing the exhaust sound from the test hydrocopter model, I would tune the oscillator to the same frequency and read rpm off of a calibrated dial. The oscillator output amplitude was first adjusted to about the same amplitude as the exhaust sound, to simplify the "zero beating" operation. The oscillator was designed to put out spikes like the exhaust sound, instead of a sine wave. This also made the synchronization by ear much easier. I have since used this sonic or audio tachometer to determine the rpm of R/C model airplanes in flight. A very handy instrument.

THE BOEING COMPANY

I am now a retired Boeing engineer. At the time of the hydrocopter invention, I was a Boeing employee, and had signed, as a condition of employment, an invention agreement that specified, "All inventions made by the employee are the property of Boeing." In those days it didn't matter whether or not the invention resulted from the employee's work for the company. (That is no longer true).

So I submitted a disclosure of the hydrocopter invention to Boeing. Actually, I would have done that anyway, even if they had no legal rights to the invention. My reasoning was that further development of the hydrocopter would need both more money and more brains than I had; and Boeing was then in the hydrofoil boat business, as a sideline to airplanes.

I made several presentations on the hydrocopter to the Boeing hydrofoil engineering organization. For the most part they were not favorably impressed. I also made a pitch to the Boeing Patent Staff and to an engineering vice-president. Boeing paid for the hydrocopter patent, but that was the extent of their participation in the invention.

And why wouldn't a sharp, large company like Boeing be interested in such a wonderful invention, you might ask. "Because it was no damn

continued on page 40

WAXING WIN

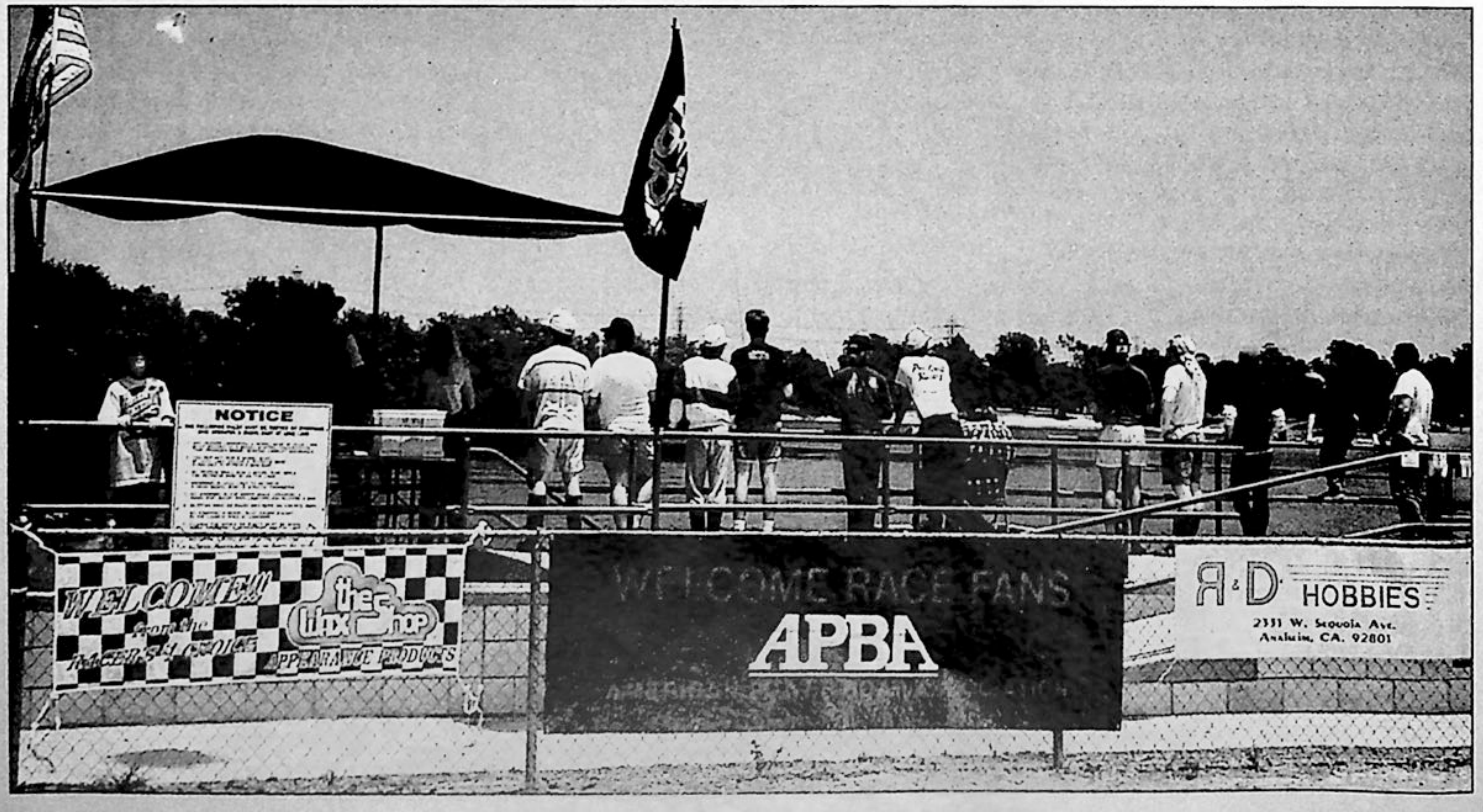
BY PAM STEWART

Memorial Day weekend. Traditionally, a young man's fancy turns the TV to the Indianapolis 500. Our five-inch black-and-white television, connected to the district director's truck battery (it was the least he could do after scheduling a race for this particular date!) provided us with constant, current information as to the status of the famous race, between heats of model boat competition. "Who's winning now?" "I'm not sure . . . think it's the gray car!"

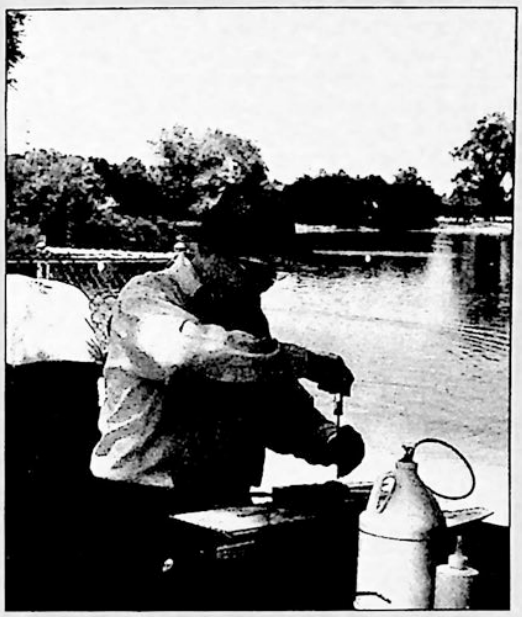
The Wavemakers, an RC model power boat club from Bakersfield, California, home of a lot of great racers (not to mention the Indy winner, Rick Mears!), but not a lot of water . . . great or otherwise, hosted its traditional, annual regatta in Los Angeles County this year, at Legg Lake within the Whittier Narrows Recreation Area. Mild weather conditions provided the contestants with one of those ideal weekends at Legg Lake . . . with Sunday's climate adding additional confirmation to the claim that this site has some of the best "racing and record setting" water in the country!

This particular regatta was fortunate in receiving assistance from first-time trophy sponsor R & D Hobbies, of Anaheim. Bob Williams, proprietor of the new business specializing in RC boats, was pleased with the coverage he received. A large banner bearing R&D Hobbies' name was

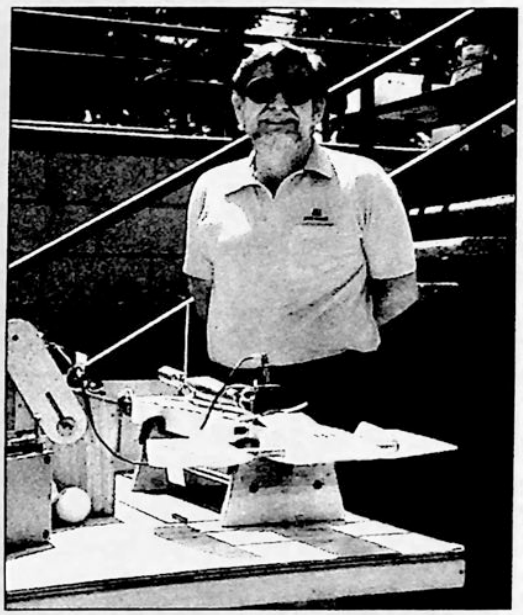
Banners adorned the fence surrounding the Hot Pit, area providing our sponsors with exposure and us with a more "professional" appearance.



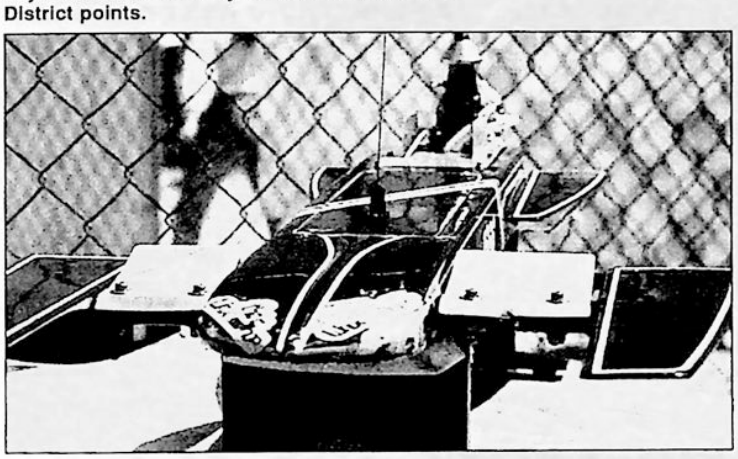
APBA R/C Model Racing Commission Vice-President Wally Stewart, prepares his son's 3.5cc Hydro before his own 7.5cc Sport Hydro, the semi-refinished "Wax Shop," winner of the day's race and currently first for the season in District points.



Don Newberger checks the head-bolts on the engine of his record setting 3.5cc Hydro . . . thinking perhaps they burned up upon re-entry??



Don Maher looks happy just before his last race of 11cc Hydro for the day. He should be, he knocked eight seconds off his own National record during the preceding heat.



Charlie Johnson's 3.5cc Outboard Hydro's Wax Shop decals serve a dual purpose: In addition to fulfilling the requirement, they hold the boat together following a pre-race collision!

visibly located in a public park in the middle of the abundantly populated Los Angeles area, in addition to the name being screened on each of the 36 trophies awarded.

Back in Indianapolis, winning the "500" provides the top performers with more than the perk of a million dollar purse. For example, if the winner has a Wax Shop decal affixed to his car he can collect an additional $5,000 prize. The Wavemakers thought this was a great gimmick and, following the production of mini

continued on page 57

Geoff DeHoog, 7, poses with his boat after winning his first 3.5cc Kids Competition. Photo by Mike DeHoog.

View down from the drivers' stand onto the launching area as Mark Grim, District Outboard Chairman assists District Director Mike DeHoog with the launching of his Sport Hydro . . . sporting a very beautiful paint job.

Julianne Swinney prepares to launch 7.5cc outrigger Hydro for "significant other," Chris Gage.

good," I humbly reply.

THE PROBLEMS

When I first invented the hydrocopter, it looked terrific to me. A high-speed marine vehicle with zero hydrodynamic drag. Fantastic! The longer I worked with the concept, however, the more I became aware of its shortcomings. It would have been expensive to build and maintain, the transmission and control systems would be very complex and heavy, and the big, rapidly-spinning rotors would have been structural nightmares. The biggest problem, however, turned out to be waves.

All planing boats have troubles in rough water. Old-style hydrofoil boats did too, as they operated at the surface. Modern hydrofoil boats, such as those Boeing built, do not. The foils on state-of-the-art hydrofoil boats always operate well submerged. The angle of attack of the foils is controlled by an autopilot such that they "fly" at a constant depth below the surface, usually at a depth equal to half the height of the foil struts. If the foil struts are thirty feet high, the waves can rise to thirty feet before they strike the hull, and before the hydrofoils become uncovered in the wave troughs. Modern "hydrofoils" are mighty smooth riding craft, and they are also just as smooth at full speed.

But back to the hydrocopter. Its foils do not and cannot work submerged. As the whole concept depends on returning the dynamic blades or foils through the air for another working pass, the blades in contact with the water must be at or very near the surface. In rough water it is inherently rough city.

I came up with one "fix" which would reduce this problem somewhat, but not enough. I proposed to mount, ahead of the rotors, a wedge-shaped strut which extended from the hull down to the normal planing level. I called it a wave splitter. Its purpose was to intercept oncoming waves, split them in two, and throw the water outside the rotor circles. The rotors, then working in water with the waves sheared off, would ride somewhat smoother. But the wave splitter had no way of filling in the troughs. Rotors bouncing in and out of holes would still give a very rough ride.

IN THE END

So I have an expired patent on a thirty-year-old fascinating, but worthless, high-speed boat invention. I don't regret a minute of the great many hours I spent on it, however. It gave me plenty of challenge, which in my book is synonymous with pleasure. I also learned a great deal in developing the hydrocopter, and learning has turned out to be a major part of my life. Most of us continue to learn, and continue to enjoy it. I didn't succeed in developing the invention to a useful form, but I'm not the first to work on this concept, nor will I be the last.

Some later inventor, smarter than I, may solve the problems that stopped me. I have no idea how he/she is going to do this, as the problems look unsolvable to me. That is not surprising. If I could have visualized the solutions, I would have continued to work toward them.

So if some of you youngsters ride on a boat that "runs" on top of the water like a duck, sometime after I've gone to my happy-modeling ground, remember that Bell and Reynolds, among others, worked on that idea once. •

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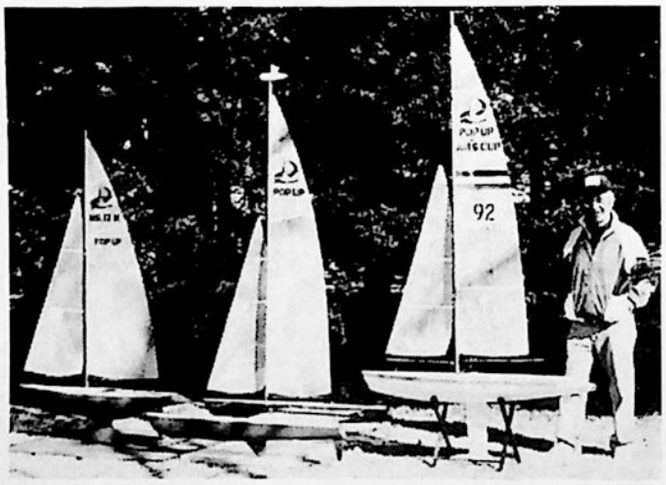

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BOOK REVIEW

BY RICHARD A. YOUNG & SCOTTIE DAYTON

Naval Warfare in the Age of Sail, the Evolution of Fighting Tactics, 1650-1815

Written by Brian Tunstall, Naval Institute Press, Annapolis, 1991. Hard bound, 320 pages, 200 line drawings, 200 photographs, notes, bibliography, and index. Format: ll-1/2" x 9-3/4".

The premise of Brian Tunstall's book is to show the importance of signal and fighting instructions as published by the admirals for use within their fleets. It's obvious that the author has done an impressive amount of research and knows his subject thoroughly, but its presentation is burdensome, boring, and nowhere near as helpful as the reader initially anticipates.

Tunstall covers every major British fleet action from the First Anglo-Dutch War to the Battle of Trafalgar, giving full weight to Dutch, French, Spanish, and British tactical thinking. Unfortunately, direct quotes are just that, and if the reader isn't multilingual, no translation is provided. Another shortcoming is not numbering the illustrations for ease of location in the accompanying text. Drawn by Brian Lavery, the nearly 150 battle plans reduce actions to their basic maneuvers. They make the book redeemable, and there should have been a lot more of them.

Tunstall writes one paragraph to describe an engagement, then runs on for pages and pages on how an admiral changed a published battle instruction from what another admiral had used previously, or would use in the future. In fact, there are so many overlapping dates that it's impossible to keep everything straight. The battles, however, are in chronological order, but don't necessarily illustrate the changes to the fighting tactics as explained in the text.

The author presents an overwhelming amount of facts, but it's doubtful if *Naval Warfare* could be employed as a primary reference source. Too many portions have been summarized. On the other hand, Tunstall documents his references, so additional research is simplified. A builder would experience a high degree of frustration if he used this book as a source for the signal flags flown by a particular ship in a specific battle. The information is there, somewhere, but it takes the reading of the entire tome to find it. Just because the index lists the page of a naval action, turning to it doesn't mean the pertinent flag information can be found.

Naval Warfare provides an insight into the futility of trying to coordinate a sailing fleet into an integral unit. Poor sailing qualities, lack of battle readiness due to illness or damage, command seniority and its consequent infighting, and the admirals' failure to take their subordinates into their confidence, all contributed to making a major naval engagement almost a comedy of errors. In fact, the more ships they had, the less decisive the result.

Never content to leave well enough alone, admirals kept editing the tactical instructions, but not to where any obvious improvement in communications resulted. It was hard

continued on page 58

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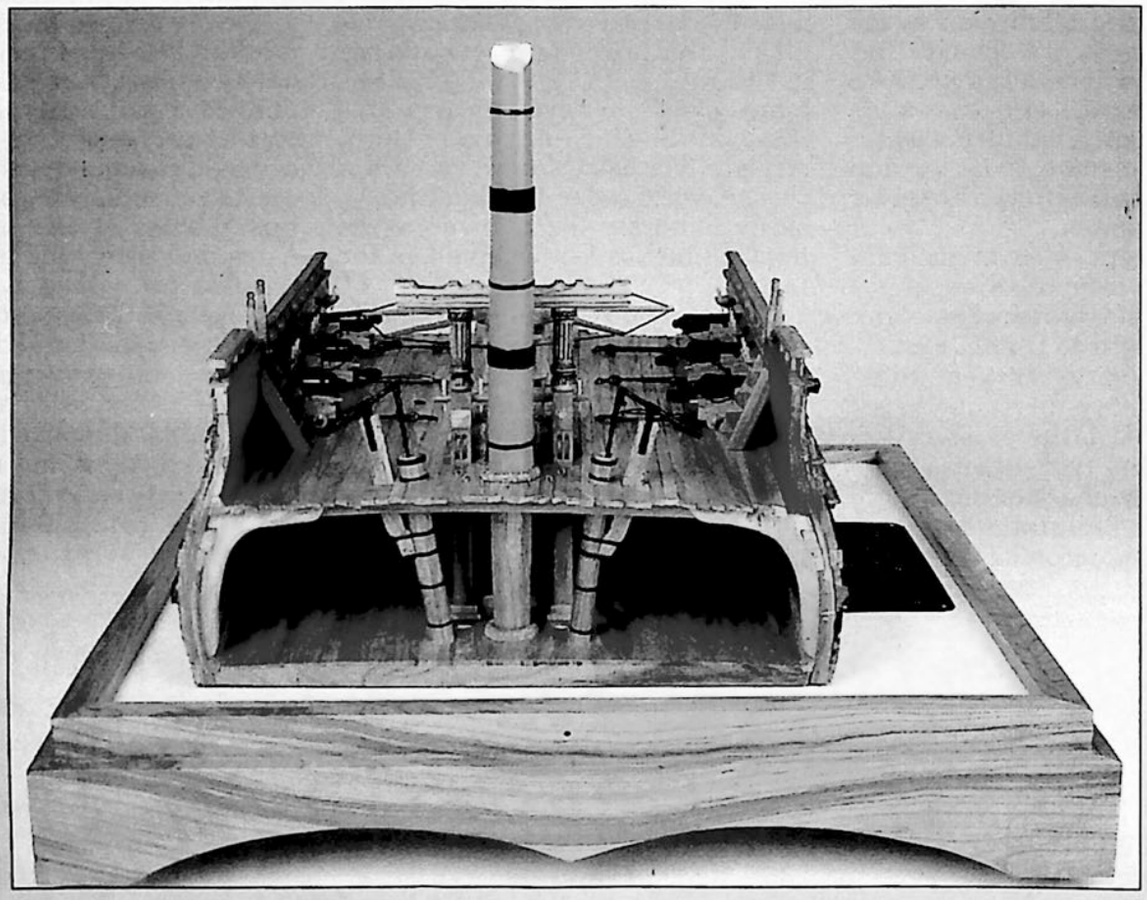
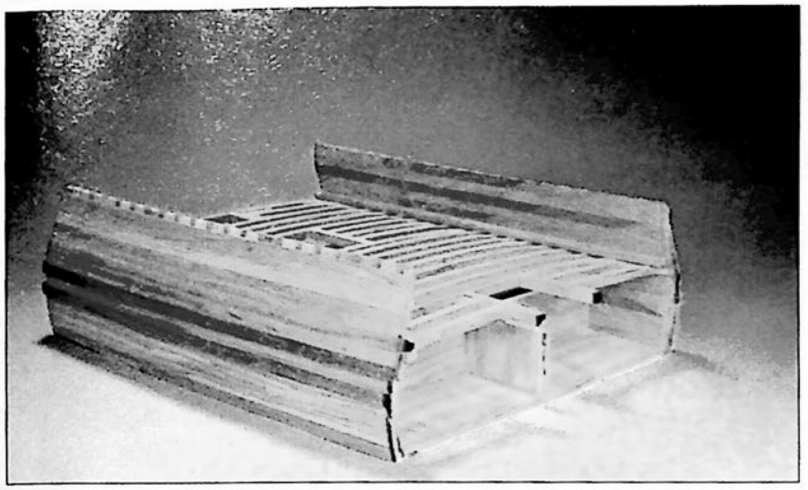
BUILDING A HALF-INCH SCALE WAIST SECTION OF THE

HMS ROYAL CAROLINE

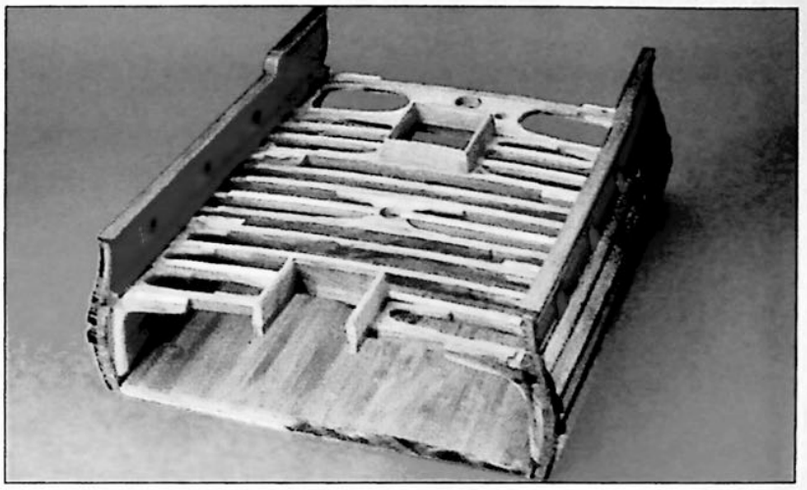


BY SCOTTIE DAYTON

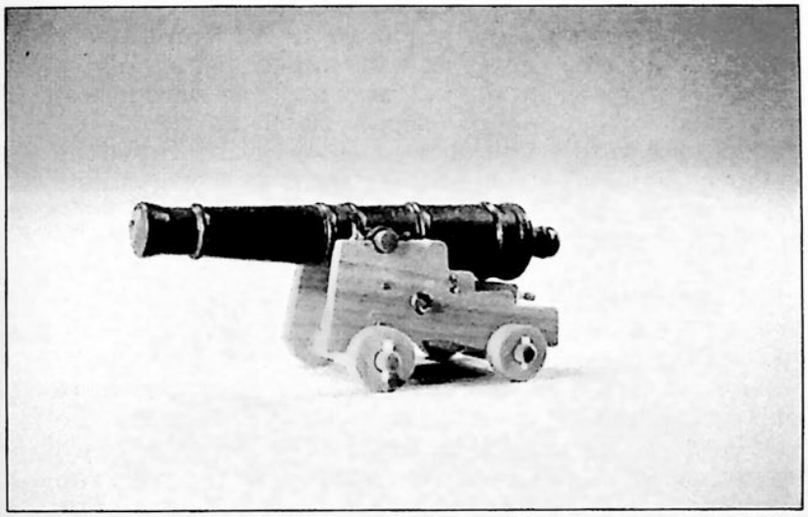
The type of client I love is the person who says to me, "I'd like to own one of your models, but am not sure what I want. My budget is so many dollars." With a proposition like this, I can suggest ships in which I have a personal interest. Such was the case with the royal yacht *HMS Royal Caroline* (1749). A waist section presentation was chosen to accommodate my client's fascination with artillery as well as his checkbook. The commission allowed me to do some timbering, to work on a large scale (1/2" = 1'), and to display my skill at carving.



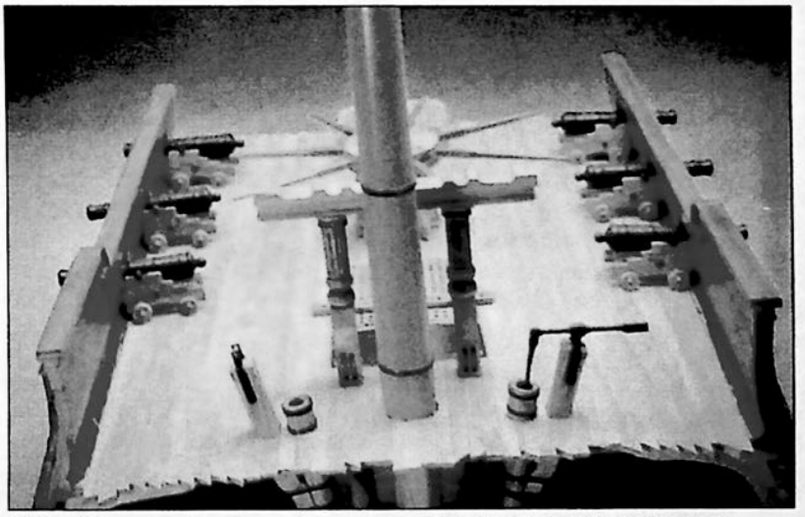
Hull is planked, black walnut wales are in place, and the upper deck framing is completed. Note the toothpick points penetrating the lower deck's port ceiling planking.



Natural applewood knees installed and the lower deck planked after duplicating the bevel and shape of the original baseboard. Note how clearly the treenails show up passing through the starboard end timbers. Hatch coamings and cap rail are completed. Bulwarks have been spray-painted red and the exterior gunport strakes blue. Penetrations for the mainmast, starboard topsail sheet bitt, and capstan can be seen.



The four-pounders took three weeks to complete and are composed of 48 individual pieces. Barrels are turned from brass.



All the fittings in place for a photo session. Note the different mouldings on the columns supporting the boat gallows.

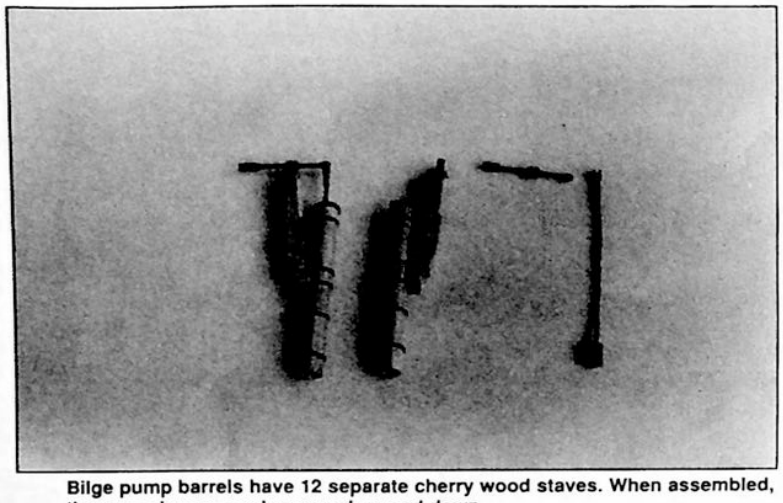
As this was my first waist section, I was looking forward to the challenges it would provide. The model would include Stations 5 through 10 and would be cut off just below the lower deck. I especially wanted to show the capstan, main topsail sheet bitts, bilge pumps, and mainmast as they descended through the upper deck. My first concern was how to finish the open ends, bulwarks, and decks. Secondly, the cutoff line ran athwartships through the fore hatch, and I had no idea if its unsupported end could be strengthened sufficiently. Furthermore, the open hatch could cause deck timbering problems. Lastly, how in the world was I going to mount the model to its best advantage inside a plexiglas case? In my nativity, I felt the remaining construction would be straightforward; in fact, relatively simple. My primary reference source was Sergio Bellabarba and Giorgio Osculati's book, *The Royal Yacht Caroline 1749* (Conway Maritime Press, 1989).

I started building using a modified bulkhead method, because the model was constructed from the inside out. Half bulkheads were traced from the lower deck line to the gunwales following the body plan. The body plan was to the inside of the planking, so I reduced the 1/4-inch plywood bulkheads 1/4 inch to accommodate the ceiling planking and frames. An additional 1/8 inch was removed, as the bulkheads would abut to a center "backbone." The backbone, also a piece of 1/4-inch ply, was as long as the waist section, as high as the gunwales, and glued upright on a baseboard that was sawed out following the curve of the sheer plan. Station lines were drawn on the baseboard and backbone.

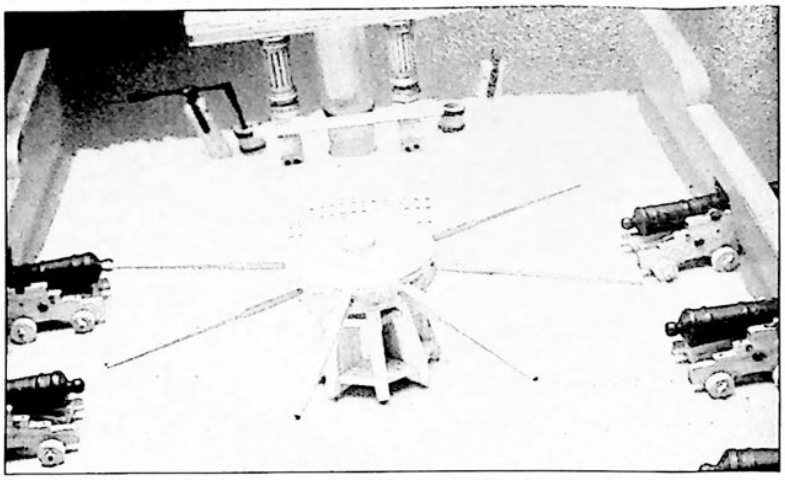
While cutting the bulkheads on my band saw, I removed their center portion starting below the deck framing line, continuing athwart to within a 1/2 inch of the bulwarks, following their shape up to a 1/2 inch from the top, then straight across to within a 1/2 inch of the centerline, down again, and out the entrance hole. These openings would allow me to easily break off the tops of the bulkheads to facilitate deck framing.

The first bulkhead was positioned and hot glued along its bottom and centerline on each side. To keep the structure vertical and provide extra strength, 1/4-inch ply spacers were cut and inserted between every bulkhead at about a 45 degree angle. These were installed as the bulkheads were raised. When the assembly was completed, it was sanded and faired (Figure 1). A one-inch wide Dremel medium grit sanding belt slipped over a 1 x 3/4-inch pine board rounded at the ends served as my sanding block. This gave me a long sanding surface while the block's narrow width made it easier to follow contours.

I glued a one-inch wide by 1/8-inch



Bilge pump barrels have 12 separate cherry wood staves. When assembled, the pump levers can be moved up and down.



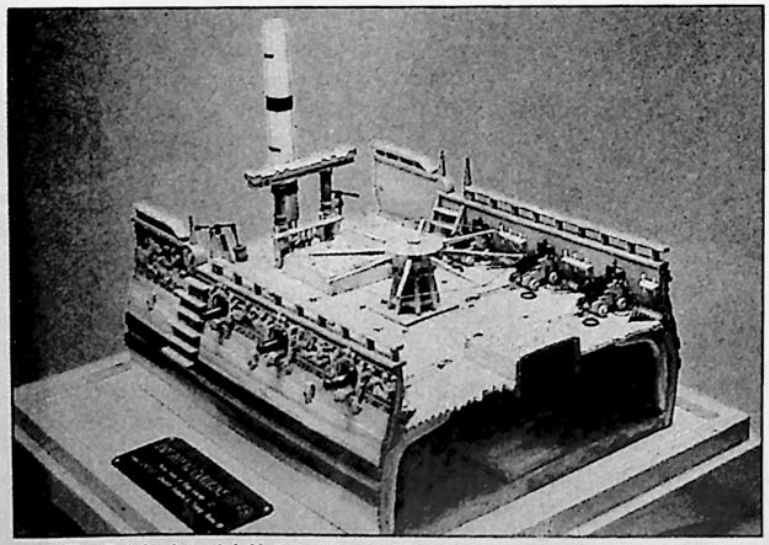
Mouldings on capstan bars are easily discernible. Capstan head is comprised of 16 wedge-shaped pieces, eight on the upper disc and eight on the lower. A compass rose carved from applewood decorates the center of the head.

thick piece of scrap wood fore and aft across the top of the bulkheads so it overhung their edges by an 1/8 inch. This was repeated on the other side. These two boards would act as a gauge for the bevel of the top ceiling planks, the only ones requiring it. I calculated the space between the bottom of the gauge plank and top of the waterway, then divided the distance by five to establish the width of the planks needed to cover that area. After the applewood was sawed, I cut the bevel on the first plank to match the gauge. That plank was attached to the bulkheads with treenails, but no glue. I used only as many pegs as were necessary, because their holes might have to be filled later. The remaining bulwark planks were fastened likewise.

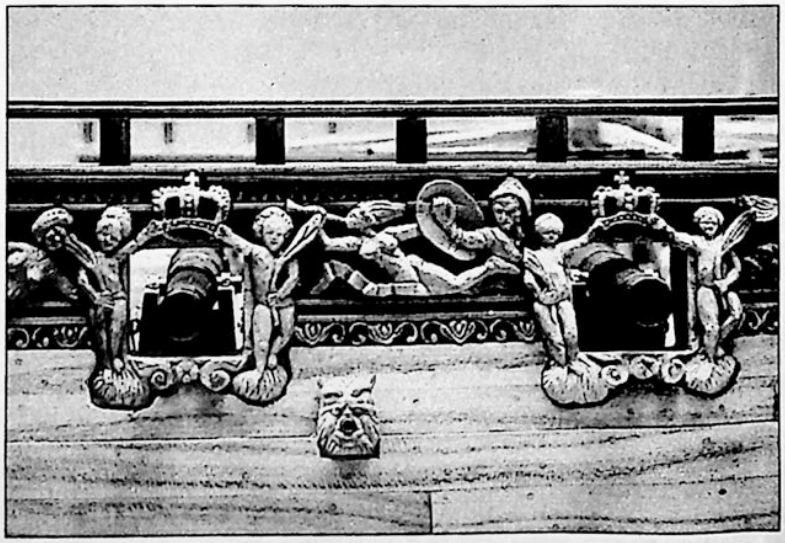
The next step was to measure on the midship section view the distance from the waterway to the bottom of the deck clamp. This space was filled with scrap lumber the same thickness as the ceiling bulwark planking. Ceiling planks were continued from the scrap wood to the bottom, then the gauge planks were removed. The reason for the scrap is to eliminate having to notch the bulkheads to accept the thicker planks in this area.

Over the exterior of the ceiling planks went two layers of steam-bent laminated frames. (I laminate because it's stronger than single, solid bent frames, and easier and faster to make than laying out and sawing them. I've used this method for 15 years and have never seen any signs of deterioration.) As the scrap filler would be removed later, I didn't glue the frames to it. Frames were set up room and space, but omitting the first ones fore and aft. Apple frames went at the six gunport openings, the rest were 3/8-inch wide by 1/16-inch thick yellow birch. All frames were glued and treenailed, using only as many flat toothpicks as were necessary to secure them. Particular attention was paid to the drilling so the treenailing would look shipshape from inside.

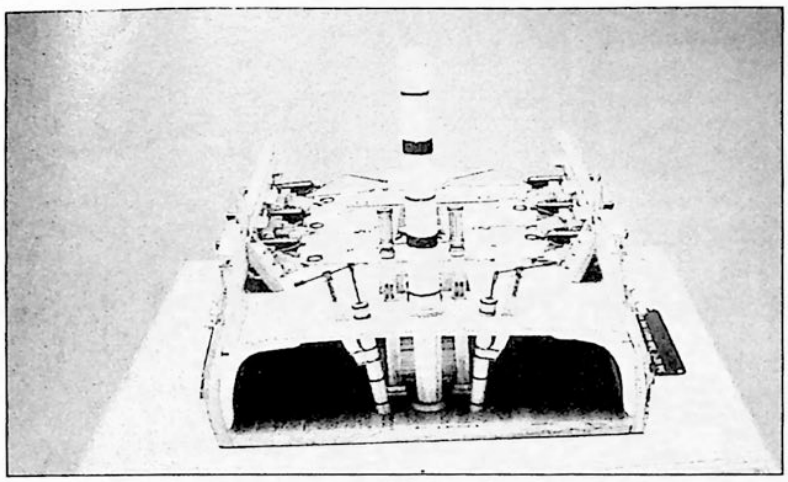
I prefer flat toothpicks for treenails because they're white birch, a relatively soft but tough hardwood. Although they appear square, they'll turn round when driven into a hole. Don't attempt to cut the treenails to their finished length. Just dip the point in white or yellow glue, place the entire toothpick in the hole, rap sharply with a 10-inch bastard file, and break off the remaining portion. A file works better than a hammer because the head of the toothpick is caught and held firmly by the file's serrated surface, permitting the treenail to be driven in tightly. Don't



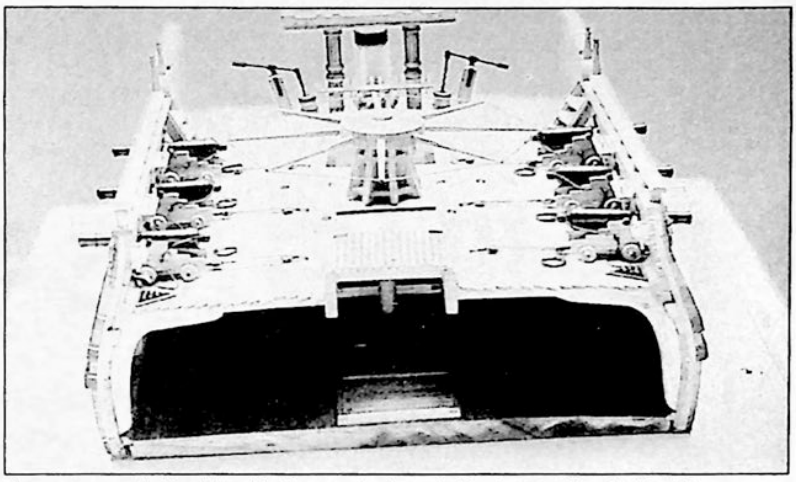
The finished model. Note swifter running around the ends of the capstan bars to keep them in place. Twenty-two deep relief figures and 64 inches of freizework in two patterns decorate the hull. Almost one-quarter of the model's total building time went into carving the ornamentation. There are 25 figures in all. Off-white underwater hull blends easily into the cream colored naugahyde-covered base.



Note the two different freize patterns, mouldings on the stanchions, cap, and handrails, and the head of Pan with the scupper coming through his mouth.



Waist section of the royal yacht *HMS Royal Caroline* at half-inch scale measures 14 inches long, 11-1/2 inches high, with a 12-inch beam. It took 500 hours to complete and now resides in a private collection.

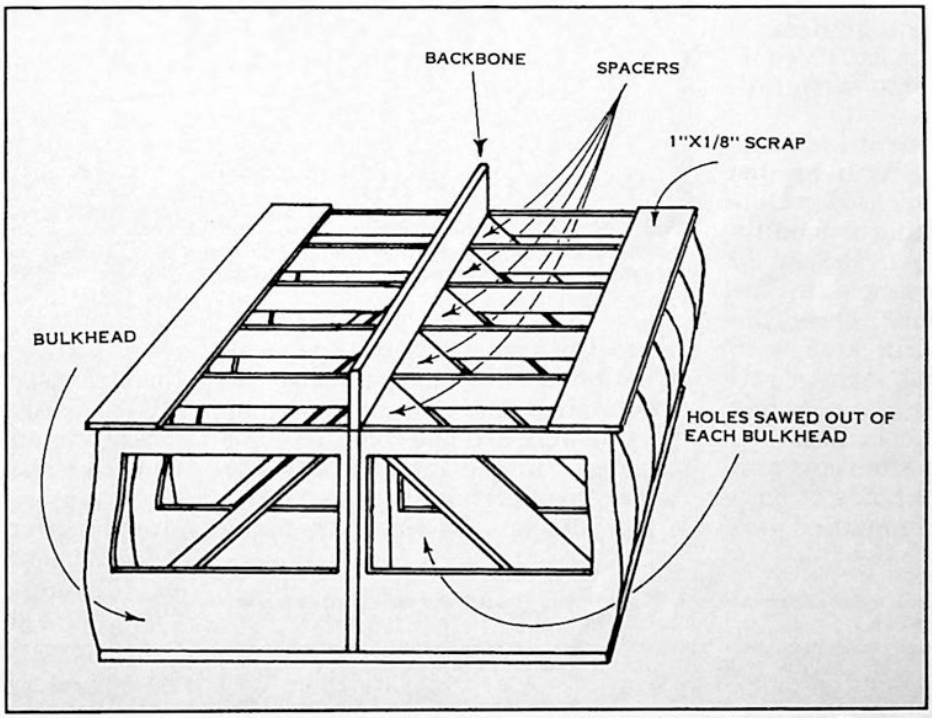


The unsupported hatch with the capstan's spindle descending behind it. Holes in the hatch grating are for the anchor hawser. Cannonballs are turned from applewood and painted.

worry about the point coming through the other side, as it can be broken off later. The exterior toothpick stubble is quickly dressed with a scraper, then sanded smooth when treenailing is completed. Toothpicks can be easily carved to the proper dimension if out of scale. They can be resharpened and recycled until they're too short to grasp. Lastly, when used in dark wood they show up well because they're lighter. By the same token, when driven into lighter wood, they appear darker.

After the first layer was in place, I faired and smoothed it with a long sanding block. Then the second laminate of 3/8 x 3/32-inch birch frames was glued and treenailed on top of the first. Pegging is important here, because it will prevent delamination should the adhesive fail. Apple frames again were employed at the gunports. I steambent four solid 3/8-inch wide by 3/16-inch thick apple frames, then glued and pegged them to the ends of the ceiling planking. These became the first fore and aft frames of the waist section. (Frame thickness was determined from the midship section view.) Once more the entire structure was smoothed and faired with a large sanding block, working in the taper of the frames from the gunwale to the bottom of the model.

I trimmed the frames from the top of the ceiling planks, being careful not to nick them and to maintain the exact bevel. Frames also were trimmed off at the bottom of the baseboard.



Bulkheads are erected on the baseboard. Between them are 1/4-inch thick ply spacers. The "backbone" rises up through the center, while one-inch wide scrap wood runs fore and aft across the top of the bulkheads.

External planking commenced, using the midship section view to determine the thickness and shape of each plank. The first plank was a frieze moulding. It was easier to mount if a piece of scrap wood was positioned across the top of the bulkheads, again allowing it to overhang by an 1/8 inch. The moulding butted against the scrap. Planking the remainder was straightforward, because none of them required tapering or other edge treatment.

Although this sounds radical, I removed the top portion of the bulkheads with a large pair of common pliers. The noise was terrifying, but no damage occurred. Next to go were the spacers and backbone. Spacers were pried out, and the backbone was sawed off even with what was left of the bulkheads. After that I rough cut the gunports, which were finished later with a file. Scrap wood planking was pried out with a chisel, then the deck clamps and waterways were sawed and fitted. Deck framing proceeded as normal.

Now came another nervous little trick. The rest of the bulkheads had to go, but by this stage they were inside the model and impossible to reach. So, I raised the blade on my eight-inch table saw high enough to cut through the baseboard and bulkheads, but not the deck framing. Two full-length cuts were made, one on each side of the backbone approximately one-half the distance between it and the bulwarks. I had to be careful because this was a freehand procedure. With a sigh of relief, I watched the middle section fall right out. It's removal made the model

continued on page 61

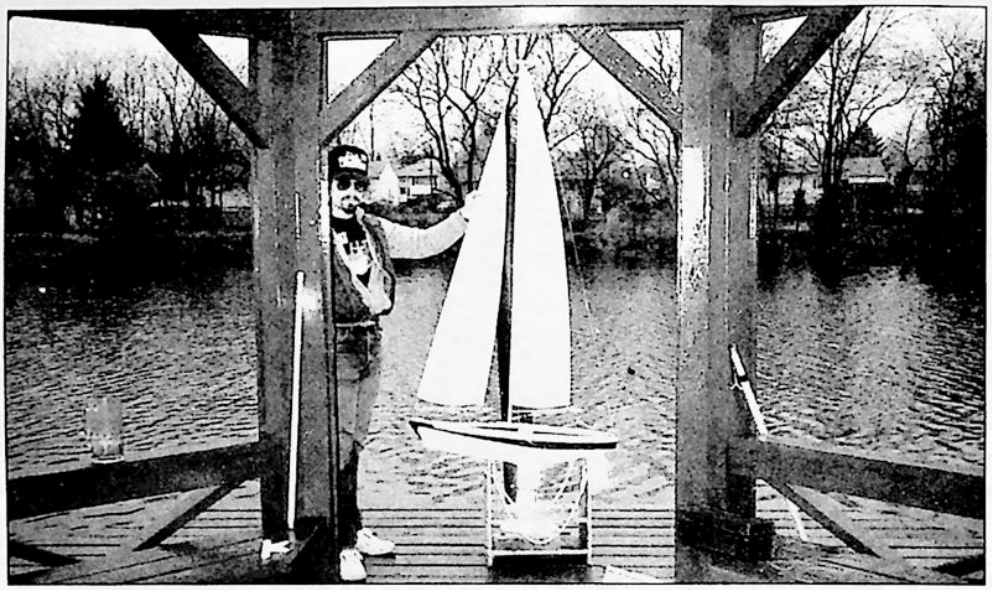
STRICTLY SAIL

BY ROD CARR

TUNING & SAILING GUIDE

I have received a number of requests from readers for more information on the tuning and trimming of model yachts, their sails, and equipment. In response, I am providing in this edition the first half of a collection of articles which I have been writing for my local club's monthly newsletter. Using the East Coast 12 Meter as the test boat, the series has wandered through the many and various adjustments that can be made on a typical RC model yacht. If your boat is significantly larger or smaller than an EC/12, you'll want to adjust any dimensional information that occurs.

Also included this month is some useful information sent in by Joe Glova, of New Brunswick, New Jersey. Joe has been working on modifying the popular Dumas/Huson 36 model. Originally designed in the early 70's for the 36/600 class, the Huson 36 sported a fin keel with internal lead shot ballast. As sail rigs have gotten taller, the boat has shown a need for a deeper keel. Joe has taken the keel by the roots and shares with us some photos of both stock Husons and the modified versions. His comments on keel construction are very applicable to the four to six-pound keel bulb regime, but probably are not going to be as successful in the larger bulbs and deeper fins that have become typical of the M-class. At any rate, many thanks to Joe for his contribution to the technology of model yachting.



Joe Glova, all set to launch his revised Dumas/Huson 36 . . . with new keel and a suit of Carr sails, at the Central Jersey Model Yacht Club's neat sailing facility.

Central Jersey Model Yacht Club's stock Dumas/Huson 36 collection. The left and center models now sport new-style keel described in text.

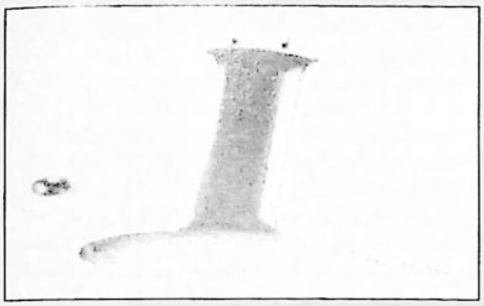
BUILDING A LAMINATED FIN

Slot and silver solder 1/4x20 bolts to each end of the 1/16x1/4 brass strap material, which is cut to desired length of keel. Laminate three 3/8x1/2-inch pine strips to form a 3/8x1-1/2 inch center portion of fin. Center and glue the two brass straps to the fore and aft ends of the center portion.

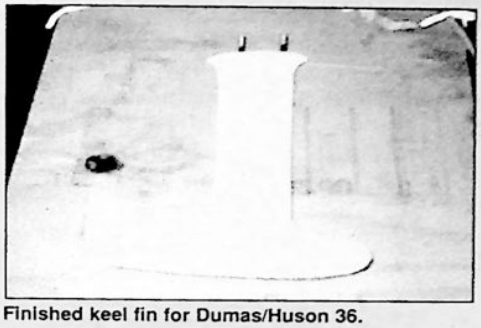
Drill four evenly spaced 1/32-diameter holes through brass straps and pine laminate. Insert and glue 1/32 brass wire through holes. Wire should extend forward not over 3/8-inch to accept drilled 1/4x1/2-inch pine leading edge. Wire extends aft far enough to engage drilled trailing edge strips, but cut off so they do not extend beyond trailing edge contour after fin is trimmed and sanded to symmetrical airfoil section.

Fit a 1/4x1/2 pine cap on each end of fin. Top one is trimmed to shape of hull bottom, and bottom one is trimmed to shape of lead bulb. Plastic filler is added to fair end caps into keel.

Joe Glova's first fin of this design



First modified keel fin under construction. Plastic filler was needed to build up center of fin as balsawood between brass straps was not thick enough to produce smooth section.



Finished keel fin for Dumas/Huson 36.

New keel fin being added to Dumas/Huson 36.

was made from balsawood and weighed only six ounces before adding the lead bulb. With the boat hull tipped 90 degrees from vertical, the balsa built fin could hold a five-pound bulb without bending. The pine fin will be even stronger, and more resistant to dings.

TUNING A TWELVE - Introduction

The following collection is reprinted from *Tuning A 12,* my columns appearing in the monthly newsletter of the Greater Seattle Model Yacht Club. The GSMYC sails the East Coast 12 meter as its one-design club boat to almost the total exclusion of any other class. The objective of the series has been to introduce sailing the EC/12 to both novice and seasoned skippers by considering one aspect of the boat at a time. The author's credentials include service as AMYA EC/12 Class Secretary for the EC/12 Class in 1970-1972, and 1987-1990, ACCR finishes of second in 1971 and fourth in 1990, a former authorized manufacturer for the EC/12 class known as CARR'S BOATYARD in the early '70s, and present service as a sailmaker and EC/12 Class Secretary for the IYRU-MYRD Technical Committee. Currently sailing EC/12 US #2, the author has competed almost continuously since the class was founded in 1970, earning the first AMYA recognized EC/12 competition series for the C.H.Black Trophy in 1970.

TUNING A TWELVE - Part I:
BY THE NUMBERS

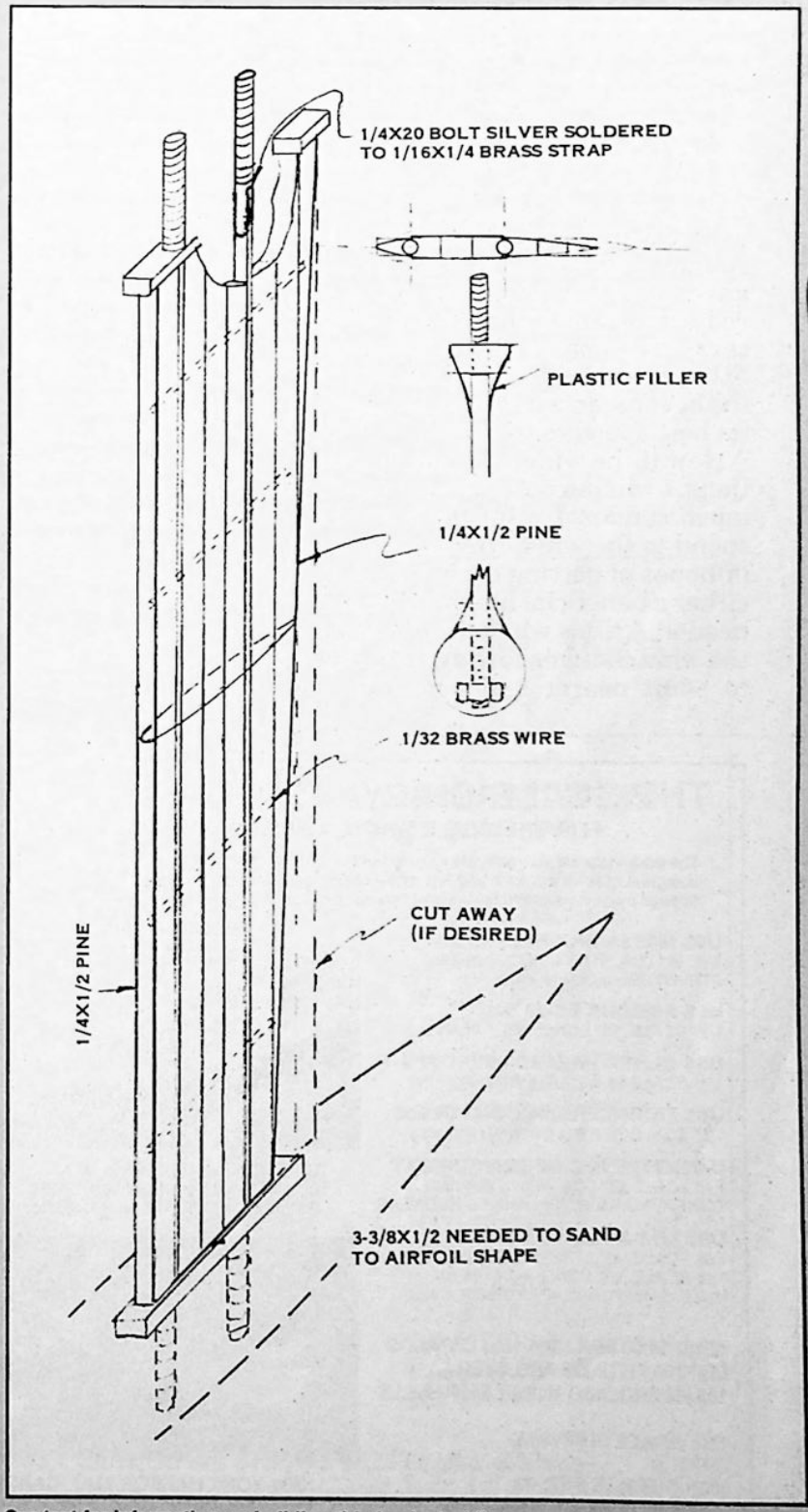
At the request of the fleet, I have agreed to give a short seminar on some aspect of construction, tuning, trim or tactics at the beginning of each practice sail on the first Saturday of the month. In order to give all skippers a chance at improvement, I will write up each lesson and publish it in the following newsletter. This means that if you come to the practice sail, you'll hear the seminar and be able to put it to use for the next regatta, getting a leg up on the skippers who stayed home.

Tuning a "12" is easy if you just follow the numbers:

1. One mast, perpendicular to the waterline plane athwartships.
2. Two fingers of camber for the foot of the jib.
3. Three fingers of camber for the foot of the mainsail.
4. Four knuckles between the back of the jib club and the mast.
5. Bottom mainsail batten parallel to centerline when closehauled.

These setting are a good average condition and will guarantee a boat which will move through the water ready for fine tuning. Next month we will work on boat balance, how much weather helm is enough. Till then, try 12 US 2 a bit and get a feel for a neutral balance.

continued


1/4X20 BOLT SILVER SOLDERED TO 1/16X1/4 BRASS STRAP
PLASTIC FILLER
1/4X1/2 PINE
1/32 BRASS WIRE
CUT AWAY (IF DESIRED)
1/4X1/2 PINE
3-3/8X1/2 NEEDED TO SAND TO AIRFOIL SHAPE

See text for information on building this laminated fin.

PART II: WEATHER HELM

Last month we discussed the basic configuration for setting up an EC/12. We developed a good starting setup and then said we would next discuss boat balance. So here we go. With the boat sailing to weather, closehauled, I believe proper balance has been attained if the boat will sail a steady course in steady wind with the rudder trim set half-way between neutral and full. If on starboard tack with the wind coming over the starboard side, the boat will naturally try to pull herself up (to starboard) into the eye of the wind. To counteract this tendency, I set the rudder trim to the left (port) to try to steer the boat away from the wind. The intent is to be able to pick the best course relative to the wind and maintain good boat speed. If the wind picks up a bit in speed, I have a little rudder trim left to reestablish balance. If the wind slacks off, I can reduce the amount of rudder offset I carry. The goal is always to carry as little rudder as possible, but to have the boat balanced so that it is making its best speed to weather.

Now if the wind is changing directions, I will purposefully not carry so much rudder. I want the boat to respond to the wind direction changes in hopes of getting early warning of either a beneficial lift, or a damaging header. A lift is when the direction of the wind changes so that you are able to point nearer and nearer to the windward mark. A header is just the opposite. The general rule is to tack on the headers, and ride the lifts.

If the wind is steady, I will try to balance the boat as neutrally as possible, reducing the rudder offset as much as I can to reduce the drag that it causes. In all of this I want to have the opportunity to either point (sail as high as I can) or foot (sail somewhat off the wind for speed). I can do this with the rudder, but with a jib trim I can get the same effect and not drag that barn door where it will slow me down. To point up from this neutrally trimmed, beating to weather configuration, I simply let the jib out about 1/2-inch or so. The mainsail then becomes more effective and it pushes the boat up to weather, the rudder does not prevent it from happening. To foot off, I pull the jib in the same amount, it causes the bow of the boat to be held off the wind, and the boat picks up speed. These things don't happen quickly. In a four-knot wind, the pointing up takes five to six seconds to be observable. Footing is the kind of thing that you do when you are not in close proximity of another boat and want to get to the weather mark fastest. Pointing is the kind of thing you do when you are close to a competitor and want to pinch up to weather of him to get him in your wind shadow. Remember when you point like that, you'll slow down.

Balance of the boat is dominated by the mainsail, both the amount of camber (more camber = more weather helm), and by the location of the boom when close hauled (boom closer to centerline = more weather helm). Weather helm means the tendency of the boat to head up into the wind. Sailing to weather is a dynamic balance between boat direction (pointing) and boat speed (footing). It depends on what you are trying to accomplish as to which you want to do. If your boat is balanced, and you have plenty of rudder trim to work with, you'll soon do much better on the weather legs. Keep a log of your settings. It's worth it

PART III: HULL TRIM

As part of outfitting an East Coast 12, one of the most critical steps is to make sure that the boat floats "on her lines." This simply means that when placed in the water with all her gear aboard, the boat is not listing to port or starboard, and is sitting with an actual waterline plane which is parallel to the bottom of the keel. Many, many boats are seen that are trimmed down by the stern. This is usually because the builder believes that the boot top scribed into his hull by the manufacturer is the waterline plane to which he should be trimmed. I have yet to see any manufacturer who has located the line correctly. This is not to bad-mouth our manufacturers, but merely to point out that until recently, we have not had the kind of information necessary to trim the boats as the designer intended. For our club, we have made a device which can be used on dry land to place marks on the centerline of the hull which identify the extremities of the 43-inch Max. LWL allowed by the class rules. See Figure 1 for a description of the device and make use of it at your earliest opportunity.

What difference does hull trim make? Well, when we retrimmed the Seattle Fleet during the middle of the 1988 season, we saw a general bunching of the fleet. The average time between heat winner and the last place boat was generally cut just about in half. That is, with all boats properly trimmed the relative speeds were much closer. Once you have the boat ballasted properly don't mess with it. For one thing, the new rules are not going to allow either of those two marks to get wet, so you'll have to sail the boat without changing trim. More importantly, retrimming of the hull will only slow you down. As the wind increases, make adjustments to your sails. We'll talk about heavier air sailing next time.

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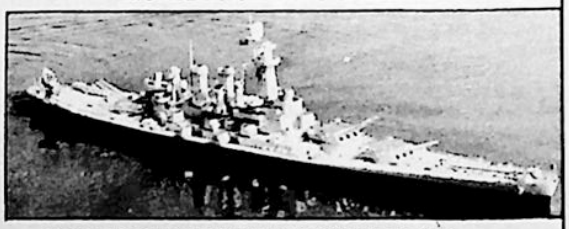

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NEW YORK HARBOR TUG "CAROL MORAN"
1:48 SCALE, 27-1/2" LONG, 7-1/4" BEAM.

PART IV: HEAVY AIR SAILING

In the previous installments of this series, we have discussed the two major methods of balancing an East Coast 12 Meter, or any sailboat for that matter. Initial balance was accomplished by a wholesale movement of the mast, the shrouds and the jib swivel attachment. Moving the entire rig fitted the boat to the kind of winds typical of the location sailed. Fine tuning of that balance was accomplished by differential trimming of the jib and of the mainsail. A combination of these two methods will be used to sail the EC/12 in heavy air, winds above eight to 10 knots.

First, under the new IMYRU Rule which we in AMYA will be voting to accept in our 1989 balloting, the EC/12 has the opportunity to utilize three different-sized rigs to cope with increasing winds. The mainsail roaches of the "B" and "C" rigs are smaller than that of the full-sized "A" rig. This has the effect of moving the cloth of the sails further toward the bow, so that as the wind speed goes up and one might want to move the whole rig forward, by merely using the smaller rigs one re-balances the boat, and each rig should place its mast in the same position.

Secondly, each of the rigs should have their sails cut progressively flatter, so that the "rounding up" tendency of the mainsail is reduced from A to B to C. By switching rigs, one automatically will have flatter and flatter sails, precisely what is called for to maintain control of the boat.

But as the wind speed varies, most skippers will want to keep the biggest suit up until they just absolutely have to change down. This means that in gusts, something must be done to keep control of the boat, preventing excessive weather helm and keeping boat speed up and retaining positive rudder control. As the wind increases, the following are generally done in order:

1. Sheet jib somewhat tight to keep bow off the wind when sailing to weather.

2. Flatten mainsail as much as possible near the head to reduce heeling, control camber in foot with clew outhaul and maintain drive low in the sail for power.

3. Sheet jib somewhat tighter so that it begins to backwind the mainsail.

4. Slack mainsheet allowing mainsail to luff between the influence of

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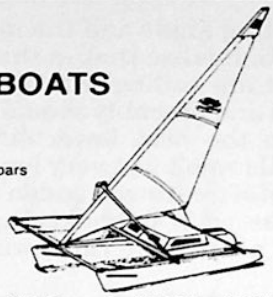

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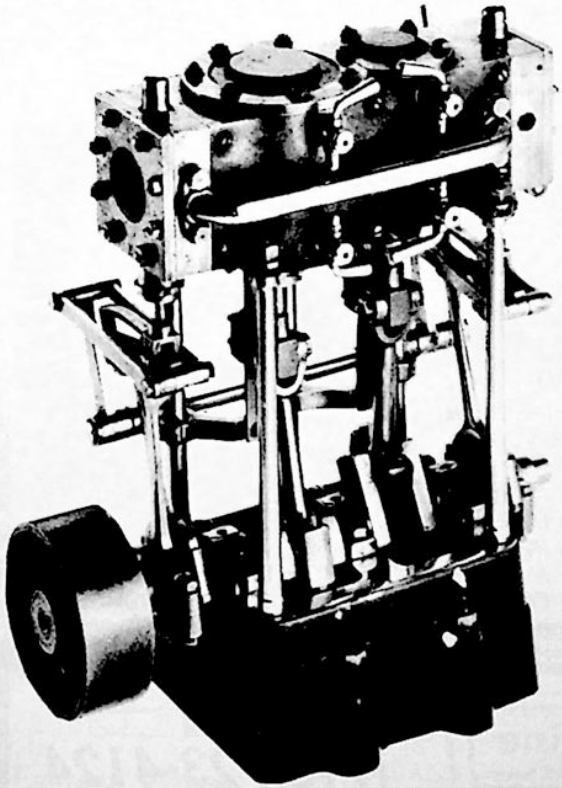

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its sheeting angle and the influence of the jib. Realize that in this condition you are sailing with a reduced sailplan and probably should change down to the next lower suit. Also mainsails won't last very long under this kind of treatment, so don't overdo it, unless your sailmaker has been looking a little bit rundown at the heels.

Sailing a "12" in heavy air means keeping control of the heel angle while going to weather. Watch both Bob Sterne and Kelly Martin; you'll find that they generally heel less than the rest of the fleet and make better progress to weather because of it. Excess heeling usually means lots of leeway, and 12s can slide downwind fast due to their fairly shallow draft.

PART V: MAINSAIL ADJUSTMENT

East Coast 12 meter mainsails are the primary power source for the boat. They also are the reason the boat heels and rounds up with a vicious weather helm in a gust of wind. Mainsail adjustment is a continuous process which goes on from race-to-race as the skipper tries to match the shape of his main to the prevailing conditions. Before getting into the details, let it be said that no amount of trimming and tuning will overcome a sailing style that tacks eight times on the way to the weather mark, when two tacks will do. Nor does it do any good to worry about tweaking of the mainsail if you have not spent time working on keeping the sail full of air at all times while sailing on the course. A review of the 1989 NORC I video taken at Seattle on April 29th, shows the results when skippers don't keep the sails pulling by adjusting the trim of the sails or the heading of the boat while sailing the course.

Think of the mainsail as the gas pedal of the boat. Ideally, the pedal should be down to the floor to give maximum power all the way around the course. If you were racing a hydroplane, you would not willingly let up on the throttle, would you? So it is with an East Coast 12; the sail must be set to extract power from the wind at all times. In 100 yards of sailing to weather, if one boat never luffs the sails, and the other luffs the sails on only three occasions for only five seconds each time, the first boat will gain between 10 and 15 boat lengths on that difference alone. A similar lead can come from the first boat tacking two or three times less than the second boat. When you are tacking, head to wind, the breeze is actually trying to stop the boat!

As mentioned in the first part of this series, initial trimming of the mainsail endeavors to have about three fingers of slack between the boom and the foot of the mainsail. The mast should assume the shape recommended by the sailmaker for the luff round cut into the sail. For example, Sterne sails typically require 5/8 to 3/4-inch of mast bend at the spreaders, whereas Carr sails are cut to sit on an absolutely straight mast. The sheet is trimmed so that when closehauled the bottom batten of the mainsail is parallel to the centerline of the boat. (Not *on* the centerline, parallel to it.) A boat set up this way will make good progress to windward and will not be outfooted by many. Some skippers set up their controls so that this configuration of the mainsheet and sail is obtained with the trim function on the winch in the middle position. Trimming all the way in will bring the mainboom in and allow the boat to point higher, but go somewhat slower. Trimming all the way out will make the boat foot, head somewhat off the wind, and move much faster.

In the 2-8 knot wind range, the upper half of the mainsail should have a nicely developed camber. Mainsails that are too flat above the top batten do not develop the power of more curvaceous varieties. Some sails are made with head reinforcements which are entirely too big and stiff . . . beware of them.

The sail should twist as little as possible, as controlled by the tension of the vang. But a small amount of twist is acceptable and the last bit of sheet movement toward "closehauled" should pull the sail down, tightening the leech and reducing the twist.

Under these conditions, the boat should require about half of the available rudder trim from dead center to maintain a steady course. The boat should head up if the wind speed increases, and fall off if the wind drops. If the wind changes direction, the boat should be balanced enough to follow that change by itself.

As the boat is brought up into the wind, the top of the jib should be the first thing to shiver and give notice of its nearness to luffing. This allows the skipper to steer a bit away and thereby keep the mainsail full of wind, developing the power we need to keep the boat moving.

Next month we'll trim the main for heavy air sailing.

PART VI: HEAVY AIR ADJUSTMENTS

Unique among racing model yachts, the East Coast 12 is a scale model of a real boat. Designed in the early '60s by Charlie Morgan, as a forerunner to "HERITAGE," the EC/12 was tank-tested but never built as a full-sized boat. The tank testing hull was used as a plug to make a mold from which

continued on page 60

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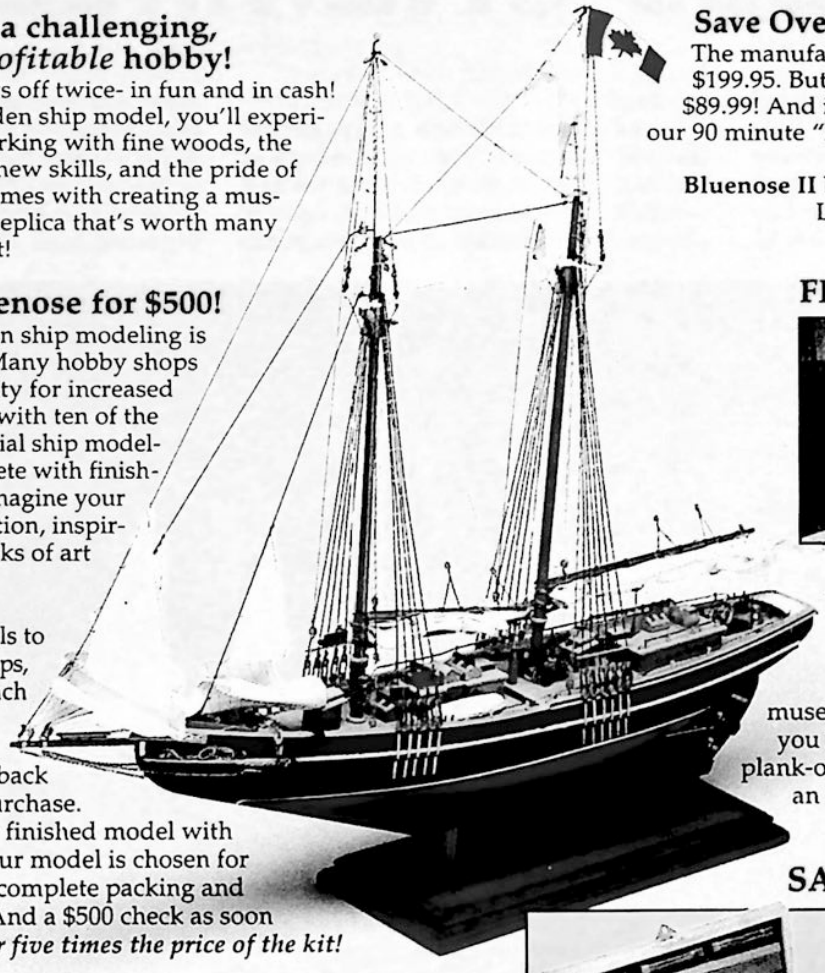

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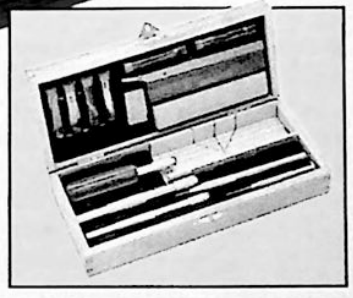

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PRODUCT SURVEY

BY DAVID FRANK

ROBBE 'UNLIMITED'

I first saw the Robbe "Unlimited" in the Summer '90 issue of *U.S. Boat & Ship Modeler,* and was interested in seeing one in person. So I went down to my local hobby shop and they had one on the shelf.

Running photos—radar gun picked up the Unlimited at 18 mph.

The shop owner allowed me to open the kit to inspect the contents. What I found were two large vacuum-formed hull halves, several small formed parts, a couple of plastic bags containing the drive system, miscellaneous parts, rudder, and turn fin. There were also some wood pieces used to strengthen the hull structure. I also found two EF 76 II motors and a two-step, mechanical speed controller. Along the bottom of the box was a very large color decal sheet, plans and instructions.

I noticed the formed ABS plastic parts had a high gloss finish, which is different from most plastic hulls I've seen. The boat measures 33 inches long, with a beam of 15 inches, and a height of 9 inches. After several minutes of moving the parts around in the box, we finally got everything to fit so we could get the top back on!

I was impressed with the quality of the parts in the kit and the design of the hull bottom was close to what I would have come up with if I were to design a hull of this type. Being further intrigued, I contacted my editor, Bill Northrop, and soon received the kit, along with a Robbe "Echo Star" and a Kyosho "Hurricane," which I will review in future articles.

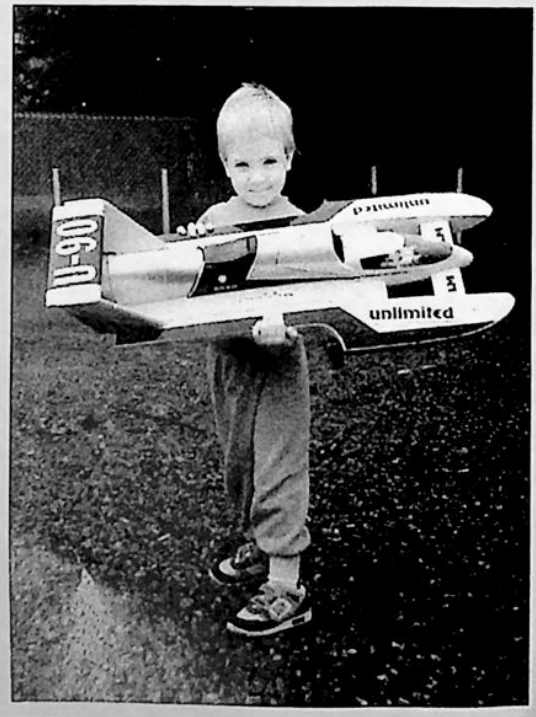
When I received the kit, I first pulled out the instruction sheet and the plans to study the building process. The instruction sheet was written in four languages (including English) and included a complete parts list. The instructions were in a step-by-step format, and along with the plans sheet, I had no trouble assembling the boat.

CONSTRUCTION

Without going through the entire step-by-step construction, I'll try to point out notes of interest as I was building the model.

First step in the instructions was the building of a stand for use while building and transporting the boat. A separate plans sheet was included which showed how to build the stand. All measurements were in millimeters and it called for the use of 10mm plywood. I had a piece of 1/2-inch plywood and after adjusting for the

Author's son, Eric, holds the Robbe Unlimited. This is a big boat.



difference in width, the stand worked well. I later gave the stand a coat of white paint and put some foam weather stripping on the tops of the rails to prevent scratching the hull.

The instructions called for using Stablit Express glue in assembling the model. I believe Stablit Express is an epoxy type glue. I've never been one to wait for glue to dry (or paint to dry, for that matter), so I decided to use good old Hot Stuff. I have used cyanoacrylate glue in ABS plastic kits before and have had no problems. I used medium and thin viscosity Hot Stuff glues along with Kick It glue accelerator. The glue kicker overspray dulled the gloss finish, but after I completed construction, I waxed the entire hull with liquid Turtle Wax and brought back the original gloss finish. This also smoothed out some of the sanded edges.

The boat design relies on the hull being watertight for flotation in the event of a flip, but if you were to hit something in the water, the hull might crack and fill with water, sinking the boat. So, before joining the hull halves, I installed blocks of white foam shaped to fit in the sponsons and hull sides.

The hull halves mated together remarkably well. I filled any gaps in the seam with medium CA glue.

After joining the hull, I cut the opening behind the driver and installed the cradle which holds the running gear and radio.

The motor installation calls for putting capacitors across the motor contacts and gives detailed instructions for doing so, but the kit didn't include the capacitors. I had some spares and installed them as instructed.

The speed controller had AMP connectors for the motor and batteries. There wasn't a mating connector for the motors, so I cut off the connector and soldered the motor leads directly to the motors and installed Sermos connectors on the battery input leads. The motors are wired in parallel so both motors get full voltage. The speed control has three positions: stop, low (battery packs in parallel), and high (battery packs in series). For this to work properly you need two packs of the same voltage and capacity.

The gear box has a 2-to-1 speed reduction which allows the use of larger props and longer run time.

The radio area is very small. I would have had to use micro components and probably a battery eliminator circuit (BEC) to avoid having to install a receiver battery, to get everything to fit in the provided space. Instead, I cut an opening in the front of the cradle which opens into the area beneath the driver figure. I put the receiver in a plastic bag and closed off the end with a plastic wire tie and pushed it, along with the receiver battery, through the opening, leaving plenty of room for the rudder servo and speed control.

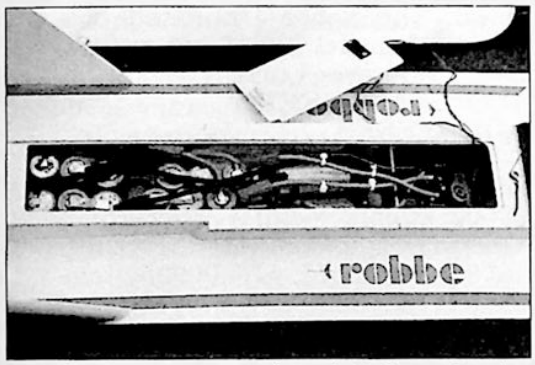
To mount the rudder servo, I glued a piece of scrap plastic to the left side of the cradle to reinforce it for mounting the servo with two-sided servo tape. The speed control was allowed to "float" in the area next to the rudder servo.

To protect the cradle area from water splashing in, there is a sliding hatch which has vents to flow air over the battery packs. It uses a rubber band with a hook to hold the cowl on. I cut the same length off the receiver antenna as the provided steel whip antenna and soldered it to the mounting lug.

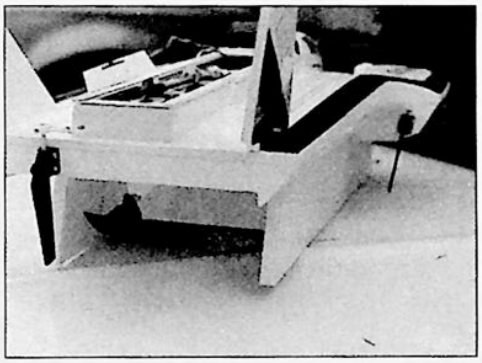
The rudder and strake (turn fin) are made from a very flexible plastic, so as to survive an accidental run up the beach. The propeller is made of a harder, black plastic and has a threaded insert which screws onto the 4mm shaft.

The front canard wings and rear wings are composed of a vacuum-formed part and die-cut flat part which together produce a solid looking wing.

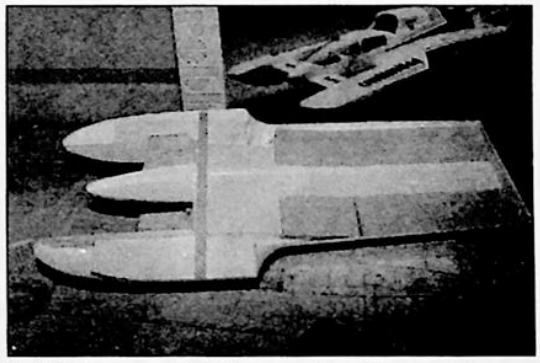
The large decal sheet had some of the large pieces pre-cut, and with use of the soapy water method, went on fairly well. I painted the driver figure and clear canopy top with enamel model paints. The turbine tube portion of the cowl was painted with enamel spray paints. After masking it off, I first painted it black and then painted it silver. This really brings out the silver. I attached the canopy with two screws instead of the recommended glue. When finished I was impressed with the size and appearance of the Unlimited. The finished length is about 33 inches and weight with two 7-cell packs is about five pounds. I was looking forward to heading for the lake.



Cradle compartment shows batteries, motors in center, rudder servo and speed control switch ahead of motors. The receiver and receiver battery are under the driver figure.



This shot shows the very flexible rudder and turn fin. They should resist breakage in the event of a grounding.



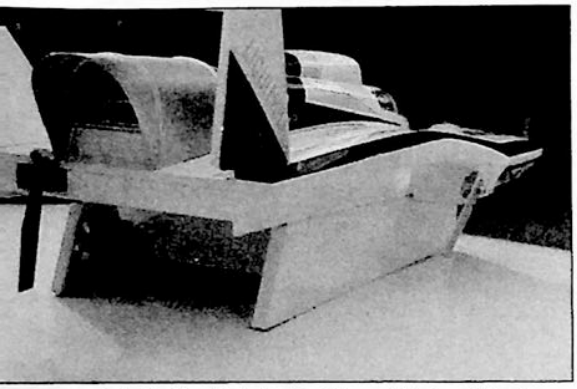
Hull during assembly. Note wood reinforcements and foam for flotation.

AT THE POND

I decided to test out the boat at a Puget Sound Model Boat Club winter fun run. Our club had just purchased a radar gun for club member use. This would be its first trial also. I set the boat up as instructed with two 7-cell SCR packs and made a quick range check. I set the boat in the water and the transom sat very low in the water because of the batteries being pretty far back.

I gave the trigger a little pull to hit the first speed switch. The boat slowly got up to speed and then I gave it full throttle and it broke loose from the water. I had to dial in some rudder trim to counteract the torque of the prop and make the boat go straight. After going out about 100 feet, I turned the boat around and aimed it for the radar gun. The gun picked up the top speed of 18 mph. I made some

more runs at the gun, getting about the same speed. At one point, I tried to make a left turn which resulted in lifting the right sponson into the air and nearly turning the boat over! As this is a hydroplane and has a turn fin on the right sponson, this was somewhat to be expected. After about four minutes of running, the boat slowed down, and I brought it in.



The Robbe Unlimited with modified rudder, turn fin, and Octura X445 prop.

Radar gun used to check speed of boat.

I checked the motors and batteries and they were warm. It was evident this boat was designed for run time and endurance.

Not being one to leave well enough alone, I decided to make some changes to see if I could improve the speed and performance. The first thing I did was to work on handling. The stock rudder and turn fin work OK at stock speeds. But I wanted to get the speed up in the 30's, and knew I had to change them to something more solid. I made the rudder from stainless steel and brass and used an old rudder bracket. The kit turn fin and bracket material were replaced with aluminum.

To improve the speed, I installed a couple of Great Planes Goldfire 19-turn, 550 motors which, compared to the stock Robbe motors, produced about five thousand more rpm. I also installed an Octura 4mm prop adapter which would allow me to use standard 3/16 shaft-size props. I put on an Octura X44 which looked a little larger than the original propeller.

With this setup I headed for the lake. On the first run, the Unlimited popped right up on plane when engaging the first speed. When I hit the high speed the boat was really moving. I got a reading of 28 mph on the radar gun. After a couple of laps it went dead in the water. I rowed out in my inflatable raft, brought the hydro back to shore, and discovered the microswitches in the speed control had fried open! These devices were not made to handle the increased amount of current the new motors and prop were putting on them.

I just happened to have a new Astro Flight Hydro Speed Control which also needed testing, so in it went. This time all worked well, I was recording speeds of 30 mph. The speed control had a good feeling with the high frequency switching and soft start, and allowed me to control the speed more smoothly. It is also waterproof, as the circuit board is dipped in a black rubber material. Bob Boucher, of Astro Flight, says each one of these speed controls is tested by submerginsily hopped up with inexpensive add-ons for increased speed. The Robbe Unlimited is a beautiful model and I get compliments wherever I take it.

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Sermos Snap Connectors, P.O. Box 16787, Stamford, CT 06905; telephone (203) 322-6294.

Satellite City (Hot Stuff), 659 Laguna, Simi, CA 93062; telephone (805) 522-0062.

Great Planes Model Manufacturing, P.O. Box 788, Urbana, IL 61801; telephone (217) 367-2069.

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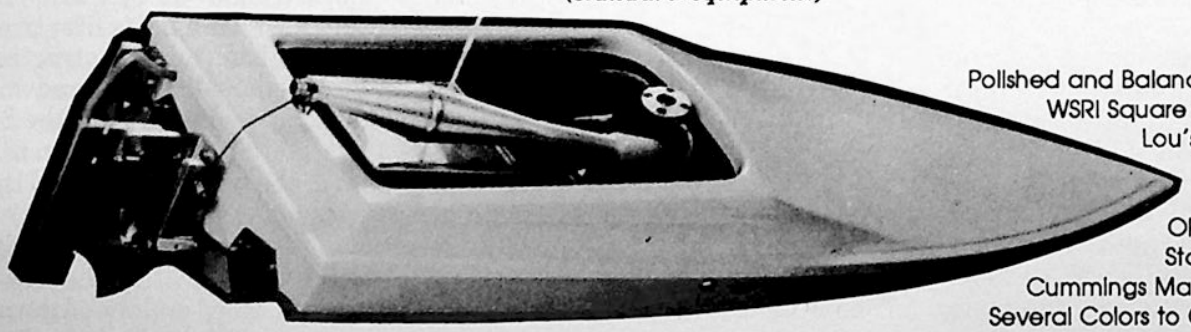

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ENTERPRISE *Continued from page 33*

stairway aft of the island flattened. Repairs, which took a week, were affected during the EAA Fly-In.

The model was certainly the center of attention tonight, but Carl Swickley, museum director, found he possessed something almost as attractive . . . the Fall 1990 issue of *U.S. Boat & Ship Modeler* with its article on Project Enterprise. Few had seen it, and Swickley was besieged by people trying to relieve him of his only copy.

After the speeches, unveiling, and photo session, a special treat awaited the modelers and their spouses. Swickley had arranged a sit-down banquet at the museum's expense to thank them for volunteering thousands of uncounted hours of their time. It seemed appropriate that the meal was served family style. Dinner conversations turned from modeling to recounting war stories. Members of the USS Enterprise Association (CV-6), the group which underwrote the model's construction plus perpetual maintenance and upkeep, also were present.

Once the tables were cleared, Swickley began the program. In his opening remarks, he stated how museum docents felt the model had "come alive" with the addition of weathering. Shep Paine, one of two men responsible for it, later told the assembly that he originally thought the task could be accomplished in three hours. He and Dr. John Leyland, an expert on WW II US carriers, arrived from Chicago at 1000. One look at the model and they knew a cursory weathering job would be worse than none at all. They set to work with their chalks and brushes, finishing 12 hours later. During the session Leyland noted that the model had only three overboard discharges when there should have been six. So, he painted on the second half. Now no one can tell which discharges are which.

One fact became obvious as each modeler stood up to introduce himself and tell a little about his part of the project. If an early completion date hadn't been set, everyone would still be working on the model. The urge to keep adding more and more detail was overwhelming. For example, there are seat belts strapping some of the pilots into their planes!

The Military Miniature Society of Illinois seemed to take particular delight in personalizing the figures they had cast from scratch-built molds. A man forward of the flag locker wears a T-shirt and Detroit Tigers cap. Another baseball fan is the photographer on top of the stairwell. His head is covered by a Chicago Cubs cap complete with orange button. The MMSI also couldn't help injecting humor into the project. On the fantail are two sailors carrying a garbage pail. There's even a poor man "feeding the fishes" (much to the docents' delight, for they never fail to mention him). Over 500 figures are on the model and 200 of them are in one-of-a-kind poses.

Bob Hinz, who detailed the basic hull, reported that he suffered postpartum depression after leaving it at the museum in August. "Suddenly, I no longer had a reason to get up in the morning," he said. His wife, Claire, added that Hinz "wandered around the house like a lost puppy." After two weeks of this, Claire suggested that he return to his *Christopher Columbus* model which had been laid aside for almost two years. The whaleback is progressing nicely and Hinz is contented once more.

After everyone had had his say, Bill Gebhard paid homage to Swickley's abilities as a coordinator and leader. Following the standing ovation, Swickley told the assembly that this evening's gathering was, for him, the highlight of the entire project. His greatest satisfaction had been watching friendships form among the modelers. The icing on the cake was having his goals for the venture superbly met. *Enterprise* was a "grass roots" effort built by ordinary modelers instead of a professional model shop. It was truly of museum quality, surpassing many similar models in other museums. Lastly, the carrier was to be a key element of the Navy exhibit. It is *the* key element judging from visitors' comments and reactions. "If I dId anything," Swickley concluded in his usual modest manner, "it was to keep the project on track, following the consensus everyone agreed to."

For this writer, there are no adjectives descriptive or encompassing enough to describe the model. The accompanying photographs can't begin to relate its immensity. I stood at the display case, like so many others that evening, transfixed by what I saw. The docents are right. She truly is alive. And, like so many others, there were tears in my eyes.

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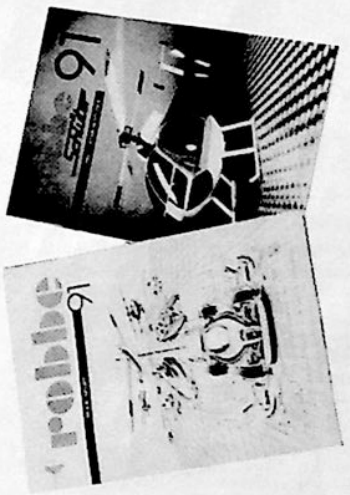

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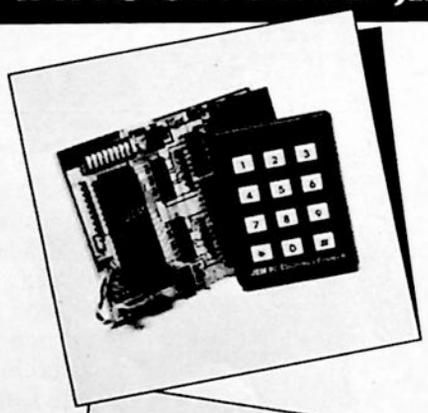

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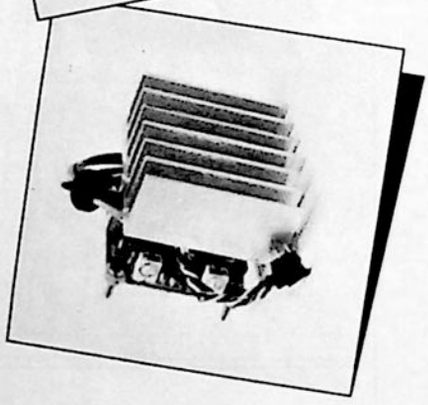

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POWERBOATS *Cont. from page 28*

the first weekend of August. In mid-August, Paul was the top qualifier for the Bill Muncey Memorial. A pinched fuel line in the winner-take-all final prevented the engine from developing full power, and he ended up in third position.

It finally all came together in Spokane on Labor Day weekend, at the Diamond Cup. After struggling in qualifying heats, Paul managed to make the first consolation. He won that event and gained the last spot in the final. As the boats were scoring up for the run to the starting line, Paul sensed the field was too early. He resisted charging towards the start with the other boats and was the only legal starter out of a six-boat fleet. However, Paul didn't hold back and play it safe. He hit the start at full speed and passed three boats in the first turn. Going up the first backstretch he was in third position in the pack, but was actually the lead boat as the two boats in front were assessed a one-lap penalty for jumping the start. Winning the Diamond Cup was definitely a highlight in our model boating endeavors because the Executone has proven to be the biggest challenge for me in model boating.

I believe I'm fortunate Paul has enjoyed model boat racing. It has provided countless hours of time together. I'm also very proud of Paul's accomplishments in model boat racing. Model boating has provided him with an opportunity to experience both winning and losing in competitive situations. He has met many new people at model boat races. I hope Paul finds an opportunity to continue in model boating as he becomes an adult. But whatever happens, I'm thankful of the many years we had together sharing model boating. •

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WAXING WIN *Continued from page 39*

Wax Shop decals by Autographics ofCalifornia, the club approached the manufacturer with the slick idea of providing the same opportunity for the winners of RC model power boat races. A compromise was reached to the satisfaction of all involved. The result was that all trophy winners in each class of competition would receive either a bottle of Wax Shop's "Slick Stuff" or "Super Glaze". . . providing the qualifying decal adorned the boat.

The Wax Shop also supplied the club with banners, in addition to the decals and their products. The company not only received considerable exposure at the site, but their decals will be seen a lot more; few modelers remove the decals from their boats and most will continue to compete throughout the season in the Southern California area, and some may even travel to the APBA's RC Model Racing Commission National Championship Regatta in Missouri.

Sometimes promoters of RC model racing events, attempting to gain sponsorships for the races, ask for "too much" from companies already besieged by requests from a vast assortment of motor sports. Compared to many of them, we are small (both literally and figuratively). With some creative thinking a promoter or club can approach a potential sponsor with an idea that might be intriguing and fun for all. Let the additional cash required for trophies come from admission, concession sales, a raffle, or some other form of promotion. A sponsor can provide more than mere money. The Wax Shop gave us exposure and visibility with which to attract more spectators. Ask not what your sponsor can do for you . . . but what you can do for your sponsor. If you don't, he will!

With the supplies of Wax Shop products available at the lake, some questions pertaining to the speeds achieved during competition might have been asked but weren't. When the Wax Shop learns of the slick surface of Legg Lake, there may be a new ingredient included in their "Slick Stuff." With the APBA's (American Power Boat Association) RC Model Racing Commission into its fourth season, national oval competition records are becoming understandably more difficult to break. Don Maher, of Northridge, CA, previously held the 11cc Hydro record (six-lap, one-mile course) since October, 1989. He succeeded in shaving almost eight seconds off that record, bringing it down to 1:07.25 (averaging 53.5 mph) with his own "Gail Force" hull, powered by a Grim-K&B 67 engine and Octura 1462 Propeller. Maher uses his own fuel mixture.

Don Newberger, of Ontario, CA, broke a record established in April, 1989 in the 3.5cc Hydro class. This record had been broken and re-bro-

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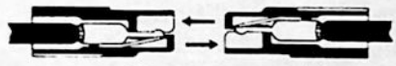
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ken several times, usually by a Sundowner hull, powered by a K&B outboard engine. Newberger's "In 'n Out" (an outrigger hydro powered by an inboard engine . . . so fast, it replaces sex for some men). "Coyote Daytona" by Pinckert Custom Boats utilized a Picco 3.5cc engine, Octura 2.0 propeller and Revenge Racing Fuel. Wanting to reassure the spectators that his record run was not a fluke, Newberger broke the record twice during the day. His final time was 1.20.88 (average of 44.5 mph). The name of Newberger is sure to be heard many times in the future, whenever the subject turns to fast model boats. Another of his boats competing (but not finishing) in a mono class gave new meaning to the term "bat outta hell" as it left the beach.

The most enjoyable portion of any event for the non-racing writer-observer are the kids and the new-guys. This regatta was no exception. Seven-year-old Geoff DeHoog's driving skills and his dad's mechanical skills have improved with each race this season. Assisted slightly by the bad luck of 3.5cc Kids Competition veteran, 11-year old Benjy Stewart, Geoff took an early lead during heats 1 and 2. He lost it during heat 3, but regained it during heat 4. Benjy wasn't too keen about losing, until he realized that with Geoff's first first place victory, he would be tossed into the lake, as tradition dictates. Benjy's enthusiasm for assisting with that activity exceeded his desire to win. Kid competitors tend to have a different set of values than their adult counterparts. Not even that went right for poor Benjy, though. Kids who learn to race RC model boats before they learn to swim do not care to experience this particular rite of passage and Geoff was no exception. When his name was called to claim his trophy, young Geoff had disappeared. An ensuing search uncovered him hiding in the outhouse, and the consensus of those present was to postpone the dunking for a year or so.

New-guys are really great, aren't they? Their enthusiasm and firm belief that racing-is-fun/it-doesn't-matter-if-I-lose, could be contagious if it weren't so ridiculous! The year is only half over, but our "Rookie of the Year" will have to be new-guy Al Zaporteza . . . the famous `Al 2'. Thankfully we don't have three other competitors at a race with the same last name as our "Rookie"! At Al 2's second District competition, he took first in the 3.5cc Outboard Hydro class. For this event, Al 2 had another new boat. He loaned his "slow" boat (yeah, right . . . the one that beat everyone at the last race) to 17-year-old Charlie Johnson. A pre-race accident caused the hull of the older boat to split, but the pit crew managed to mend the damage by sticking it back together with Wax Shop decals. At the end of the race day, the boats were tied with top perfect scores of 1400 points each. Al 2 took home the gold, having earned the faster time in a heat. There are some names that are simply destined to become synonymous with racing and racing teams. Ten years ago I couldn't pronounce Penske, either. •

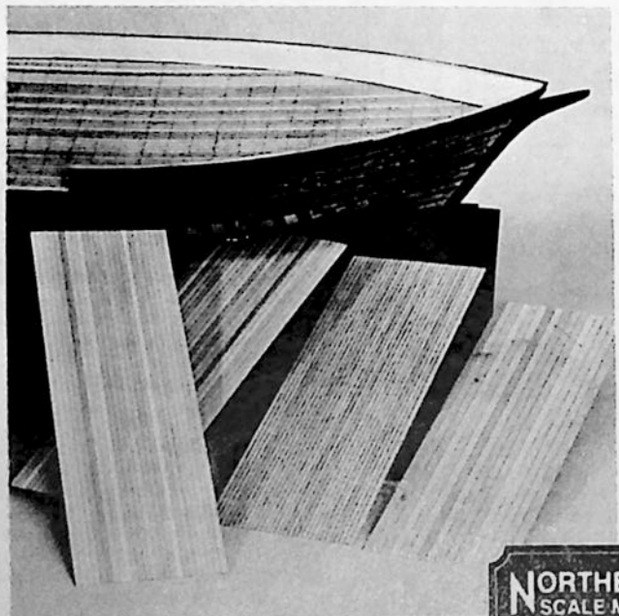
BOOK REVIEW *Cont. from page 41*

enough to see signal flags through the smoke of battle, let alone having to consult the code book (often lacking an index) to translate a recently altered directive. Signals were so ambiguous that it's no wonder captains tended to play it safe and avoided engaging the enemy.

If the reader enjoys in-depth scholastic dissertations, then he won't mind slogging through the text. The average consumer will find it a laborious, mostly unrewarding expenditure of time. Model builder and historian alike will glean little pertinent information. The one group who may value from it are the marine artists.

It's a pity that such a monumental amount of research and effort couldn't have been presented in a more palatable formula. *Naval Warfare* is basically fact heaped upon fact heaped upon fact, with no intervention by the author to humanize the statistics. Sadly, he rarely ventures forth with even a personal comment (hopefully not the result of overzealous editing). Eliminating the human element makes *Naval Warfare* as enthralling as reading the telephone directory.

The difficulty of perusing this book doesn't preclude that one won't gain insights into the frustrations the admirals faced in implementing naval strategy during the heat of battle. However, unless one is a dyed-in-the-wool researcher whose field of study is fleet signals and fighting instructions, he/she would do better to spend his/her money elsewhere. •



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came the original hulls in our class. At a scale of 9/10" to 1 foot, the EC/12 has maintained an essentially scale sail plan, with the only modification being the adoption of a working jib with the foot set on a club in lieu of the large deck sweeping Genoa jibs often seen on the prototypes. With the scale hull, we find that the center of gravity of the lead is about 5.5 inches below the waterline. A righting moment can be calculated by multiplying the weight (16 pounds) by the lever arm (5.5") and we get a moment of 88 inch ounces. A typical M-Class boat might have an eight-pound bulb and a 20-inch fin for a righting moment of 160 inch ounces, over double that of the EC/12. The inescapable conclusion is that the EC/12 is going to be a tender boat. She has got a lot of sail and her ballast is not carried very deep in the water.

The new IMYRU rule takes this tenderness into account by providing for three different rigs under which the boat can be sailed. The Full Sized or A-rig is what we have been sailing all along. It will power the boat in wind ranges up 10 knots, but heeling and down wind control become a problem above eight knots. The B-rig covers the wind range from eight to 15 knots, having only 80% of the height on the jib and mainsail luffs. Most skippers will not change down from the A-rig to the B-rig until they absolutely have to, fearing that the winds will lighten and the smaller B-rig will leave them with less power. Above 15 knots the C-rig comes into its own with luff heights of only 60% of the A-rig. The C-rig is for those few occasions when sustained high winds must be dealt with.

There is overlap between the A-rig and the B-rig. As previously mentioned, most skippers will want to keep the A-rig up as long as they can. The following discussion addresses the functional adjustments which will allow the A-rig to cope effectively in the upper part of its range.

As the average wind increases, it is usually accompanied by wave generation. The full body of the "12" needs energy to move through the waves and so as the wind picks up the ability to point becomes less important relative to maintaining plenty of way. This means that one slacks the main and jib sheets a bit and bears off some. In light air and smooth water, a properly set up "12" can tack through an angle of 82 degrees. As the wind picks up, expect that value to go up to 90 degrees, and set the sheets for it. By pinching and sailing too high in the heavier air, one will not make 82 degrees anyway, for the boat will slide off to leeward.

The next adjustment is to flatten the sail by moving the outhaul out on the boom, and increasing the backstay tension, allowing the mast to bow forward in its middle sections. This takes extra cloth out of the middle of the sail. An additional benefit is that the increased tension on the jib stay will flatten the jib automatically, something we want to happen.

In the old days, skippers would next start slacking the vang to allow the sail to twist off aloft. This would let the head of the mainsail start to luff and reduce the heel experienced by the boat. We've learned better, and now will rather choose to slack the mainsheet, letting the sail get progressively nearer to luffing totally. The reason is the horrible performance that a twisted sail can cause on the runs. That wild rolling that often ends in a broach has been traced to the action of a twisted mainsail on the balance of the boat. So slack the sheet, and sail carefully, pointing up to reduce heel by luffing the main ever so slightly.

If it gets wilder than this and you still refuse to change down, your last hope is to sheet the jib in a bit harder and start backwinding the mainsail. Soon you'll go to weather on the jib alone, the main will "motorboat," really flog in the wind, and you'll likely need a new sail after less than a season if you do this a lot.

Of course your appearance on the steps of your sailmaker's door will engender all kinds of warm feelings from him and you may even attain "preferred client" status. Who knows? Seriously though, flogging the main in heavy air will shorten its life, so only do this if you are just going to survive a squall. Otherwise change down.

PART VII: MAINSAIL CORNERS

As it is at the corners of the sail that we apply the forces that shape the sail, there is certainly some rationale to discuss those corners and how they are rigged. First order of business would be to learn the names of the corners. They are the same for the mainsail and the jib, so if we start at the top of the mast we are at the mainsail "head." Sliding down the mast until we reach the gooseneck

will put us at a nearly right angled corner called the "tack." Then out to the end of the boom we make the acquaintance of the "clew." There is no substitute for knowing the nomenclature. It is not "cute" to resist learning the names. It somehow shows to other skippers that you really aren't that serious about what you are doing. Now let us consider the rigging of each corner in turn.

The mainsail head is typically fastened to the masthead crane with a loop of staywire or some non-stretchy cord such as braided dacron. As adjustments are often made with the boats in the water, few skippers want to fight an adjustable line at the mainsail head. The lead angle of the halyard, because even though it is fixed it could be changed to haul up on the mainsail, should be parallel to the mast.

The tack provides the attachment point for the mainsail luff downhaul. This adjustment should also be parallel to the mast. Tightening the downhaul will increase the tension in the luff of the sail and pull the point of maximum camber or draft forward in the sail to counteract the force of heavy air on the sail. Always remember to slack off the downhaul after you are through sailing. That will increase the life of your sails.

The clew provides for control of the sail in two directions. First the horizontal direction in which the outhaul works. Whether a cord, or a fancy mechanical contrivance, the adjustment of the outhaul should only move the clew horizontally along the boom. This will make the bottom half of the mainsail either flatter or more cambered. Tie a loop of sheet line around the boom and through the clew grommet as a means of preventing the clew from moving in vertical direction. If it can move up, it will spill the wind by letting the mainsail leech twist. This is just the opposite of what one would like.

Adjustments to the corners should be easy to do, quick and sure. If you take the time to put some marks on the boom and mast, and keep track of where your sails were in relations to the marks, you'll be well on your way to reproducible sail setting. Of course you'll need to write down in a log book what those "just right" settings were. Jibs work the same, except one usually fixes the tack and provides a halyard at the head adjusted by a bowser. Control of the jib clew is one of the most important things to do on your boat!

To be continued in next issue. •

CAROLINE *Continued from page 45*

extremely weak. The remaining bulkheads and baseboard were cautiously broken out with those large pliers. To be able to duplicate the bevel and shape of the original baseboard, I saved the extracted pieces.

Many years ago I had collected natural applewood knees, and decided *Royal Caroline* was the ideal place to use them. They would not only be visible, but strengthen the weakened structure. I turned the model upside down, then cut and fitted four knees per side. Once they were installed, I breathed easier. The positive comments these knees have generated made the procedure worthwhile. In fact, they helped sell a commission of another waist section, this time of the Great Lakes merchantman *Alvin Clark*.

Using the saved pieces of baseboard, I fashioned a second one from 1/4-inch ply. The idea here was to build the lower deck. I removed 3/8 inch from each side and replaced it with a 3/8-inch square cherry beam to cover the plywood. Over the ply went 1/8-inch thick deck framing, ignoring camber for the time being, and sheer all together. Framing was glued and treenailed to the plywood base. Special attention was paid to those areas where the mainmast, capstan, pumps, and bitts would penetrate. If the deck wasn't supported, I'd make splinters when cutting through it! Therefore, I reinforced those places by filling between the frames with 1/8-inch thick solid pieces of cherry. Camber was established by sanding across the frames and tapering toward the bulwarks.

I planked the deck with 1/8-inch thick by 1/4-inch wide strips of cherry, ignoring all openings. Next, penetrations for the capstan, etc., were cut through the deck and halfway into the ply baseboard. Hatch coamings and covers were installed. Below-deck cabins which show on the plans were omitted, because they weren't included in the contract. The lower deck was a tight fit as I grunted and pushed it into the model, but thanks to the strength of the natural knees, I was able to accomplish this without creating a disaster. My alternative would have been to cut away part of the lower deck for insertion, then fill in the space with a plank.

The upper deck was planked with cherry, following shipwright practice. My concern about the half hatch worked itself out, because the sawed lodging knees and deck planking

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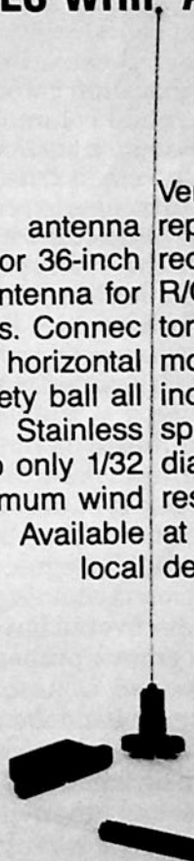
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provided the strength necessary to support it. Rather than truing the upper deck, I decided to cut the ends jagged, suggesting that the waist section broke away from the rest of the yacht. This approach is unorthodox and sure to be controversial, especially as I didn't do it on the lower deck. (Scottie likes it, but I'm still out to lunch.) Presently, comments pro and con are running neck and neck.

Deck treatment included six four-pounders which were turned from brass. Vent pans were silver soldered on, then their holes drilled with a #76 bit. Each barrel received King George III's monogram, a crown with the initials GR beneath. I duplicated it freehand with an engraving tool. This would have been an ideal place to try photoetching, but I was being pressed by a deadline and couldn't afford to take the time. Barrels were finished by chemically blackening them. Carriages were fashioned from cherry. Two-ply trucks were assembled with opposing grain. Carriages had all the accouterments; ringbolts, eyebolts, transverse bolts, tie bolts, and hinged cap squares. Extra time and care were devoted to the manufacture of these cannon and their carriages because of my client's enthusiasm for artillery.

The main topsail sheet bitts were the second most complex fitting. My initial idea was to construct them in one piece, but that didn't work well, so I made the round columns separately from the square portions. The former proved extremely frustrating. First, I tried turning the columns from cherry, but couldn't get a smooth surface because the wood splintered and tore. The same thing happened when I switched to apple. Properly irritated by now, I chucked a hunk of maple into my lathe and Lady Luck smiled.

To carve the flutes in the round columns, I had to make a tool that would produce this type of cut. A #57 drill bit was sacrificed. The blunt end was ground to a 30 degree angle, then sharpened on my honing stone. At this point, I discovered it wouldn't reach into the groove properly and tore the wood instead. Consequently, I made a 15-degree bend 1/4 inch in from the sharpened end by clamping it in my vise, heating with a torch until it glowed red, then pushing until the desired angle was attained. A handle was added by press-fitting the bit into a 1/4 inch dowel. The tool worked so well for cutting the flutes that I also used it for making the mouldings in the rest of the deck fixtures.

On top of the bitts went a boat gallows. To simplify construction, it was fashioned from two pieces of cherry, making it possible to do the numerous mouldings. Mouldings were executed on my eight-inch table saw, compound vise attached to a drill press with a Dremel #121 high-speed cutter, and freehand. I can hear you thinking in disbelief, "An eight-inch table saw for fine mouldings?" It is a marvel, and easy to do. Here's how: The secret, if you can call it that, is to make a plastic plate which fits over your saw table. Mine is comprised of two pieces. The first is 1/8-inch thick plexiglas larger than the size of the table. The second, and more important layer, is 1/4 inch or thicker plexiglas made the exact size and shape of the opening in the table. To properly align the two, center the 1/8-inch plexiglas on the table, trace around the opening with a felt-tipped pen, and glue the 1/4 inch insert to the bottom of it with Weld-On 3.

Place the assembly back on the table and trim the 1/8-inch plate to size. With your fence securing the plate, turn on the saw and slowly raise your well-oiled hollow ground veneer blade through the plastic. That's all there is to it. You now have a functional tabletop for extremely fine tolerance sawing. I can make any kind of a right angle moulding with this setup including I-beams or angle irons.

With minor variations, here's how the system works. Because I wanted only 1/32-inch deep mouldings, I took a piece of 1/4-inch thick scrap wood, set the fence 1/32 inch narrower than it, and raised the blade through the slot 1/32 inch. With the saw running, I held the scrap against the fence, lowered it onto the table, and clamped it to the fence. Now I had a false fence against which the work could be held. To make sure my measurements were correct, I ran a piece of wood through. If everything checks out okay, all you have to do is saw your good stock.

The remaining construction on the bitts was straightforward. When they were finished, I tackled the capstan. The plan showed a two-layer head comprised of 16 wedge-shaped pieces, eight on the top and eight on the bottom. The lower disc wasn't aligned with the upper, thereby preventing the seams from matching. Getting the 22.5-degree angle on the wedges was the hardest step. Any gaps would be easily spotted on this highly visible fitting.

To make the wedges, I set up numerous straightedges and stops on my disc sander at the required angles and distances. Using long pieces of cherry the proper width and thickness, it was a simple matter to sand the wedges. Before cutting them to length, they were arranged in a circle to check the fit. Had it been incorrect, slight adjustments could have easily been made. Each disc was assembled separately and cut to the desired circumference. The two were clamped together, the positions for the bar holes laid out, and drilled with a 1/8-inch bit 1/2 inch in toward the center. After unclamping the discs, I cut the half holes square, then glued the upper and lower portions together. The real head was held together with four bolts for each section, but I substituted toothpicks for them.

Because all of the capstan's parts

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were laid out so beautifully in the book, I felt there would be no reason not to duplicate everything. I was wrong. The whelps were attached via mortises and tenons to the spindle and head, and to each other with little chocks. That's the part I couldn't manage. I couldn't get the chocks with their tenons installed. I didn't want to assemble them without those mechanical fastenings, because they might fall out years from now when the adhesive failed.

What I ended up doing was cutting a groove across the whelps at the two cross section positions shown on the plans, and almost to the exterior. To take the place of the chocks, I made two cherry washers, cut an eight-sided hole in their centers, and mounted them, top and bottom, on the spindle so they were aligned with the slots in the whelps. After test-fitting, I glued the structure together, then finished the washers by cutting away the arch between the whelps. The pieces fit together so nicely that it was impossible to tell that I hadn't installed the wedges as shown. Capstan bars had mouldings cut in each corner. I chose apple for the bars because this detail can be carved in easier due to the wood's close grain. The compass rose was done in apple for the same reason.

Bilge pump barrels were composed of 12 individual cherry staves hooped together. Here again the hard part was getting the 15-degree angle on the staves. These were made twice as thick as necessary to give myself plenty of material for adjustment. After setting the angle on my table saw, I cut 15 degrees off both sides of the square stock. The barrel's bore was a 1/4 inch, so I assembled the staves around a 1/4-inch brass rod. Oops! They were too wide. Back to the saw I went to remove more stock. Now they nested snugly together. Glue was applied and the staves held in position via rubber bands using the rod as a former. When dry, I filed the barrels round and added the proper taper. Hoops were cut from brass strips and the ends silver soldered. After chemically blackening them, they were drilled and pinned with toothpicks to the barrels.

Attached to each barrel was a heavy, vertical timber holding the pump lever. These were made of cherry, then glued and strapped in place. Levers and pistons were turned from apple and painted black to resemble iron. It didn't take much extra effort to make the levers operational.

The last major fitting was the mainmast. It was laid up from four 1/2-inch square cherry timbers glued together. The spar was tapered, filed eight-sided, and rounded above the deck. Mast hoops were fabricated from brass, chemically blackened, and pressed on. The forward side of the mast had a fish which I made of cherry. Hollowing its inner side to conform to the mast proved to be the most difficult task. After gluing the fish into position, the whole assembly was spray painted with Floquil's Yellow Ochre Marine Colors. Wooldings of black Irish linen finished the fitting.

There are eleven deep relief carvings on each side of the hull. Figures included gods and goddesses from classical mythology, horses, cherubs, and crowns. These and the 64 inches of freizework in two different patterns were executed in apple using small knives, then cyanoed and pegged with toothpicks to the previously painted blue background. Carvings were left natural. When the model was completed, it was sprayed in its entirety with multiple coats of Deft Semi-Gloss Clear Wood Finish, giving it a pleasing patina.

Having worried about how to mount the waist section throughout its entire building, I now was faced with having to do something. First, I made a display base. Its frame was cherry and the base covered with cream colored naugahyde. When I placed the model on it, the effect was so agreeable that I decided to leave well enough alone.

Royal Caroline took 500 hours to build and was delivered to my client immediately after completion. That's the problem with commissions; I don't get a chance to sit back and enjoy what I've just created. The bright side, of course, is having a beaming customer and watching *Royal Caroline* become a part of one of the most impressive private scale cannon collections I've ever seen. •

nut and the strut. It will have to be shaped to fit correctly. Any bending should be done carefully to produce a gentle bend with no sharp angles or crimps to bind on the drive line.

Laminate the stuffing box in place using polyester resin or epoxy and fiberglass strips. If you first roughen up the stuffing box surface with coarse sandpaper, the resin will get a better bond.

Mike used a Westcoast Racing Products square cable drive line. This requires the use of an Octura flex ferrule just ahead of the strut. The squared end of the cable slips into a special cable nut. The cable is trimmed to length and the flex ferrule soldered onto the cable.

Set screws in the flex ferrule hold the stubshaft securely ahead of the strut. A teflon thrust washer or Octura thrust washer set is placed between the strut and drive dog. Because the squared cable end does not transfer propeller thrust to the engine, all thrust is put on the strut. The result is longer engine life as the bearings and rotor only spin, they don't absorb thrust.

One of Andy's fiberglass radio boxes fit perfectly into the hull. A Futaba S-29 servo is enough to handle this deep vee. There is plenty of room for a large fuel tank ahead of the engine mount.

Cooling water is picked up by the rudder and silicone tubing connects the water pickup and engine fittings. An Octura water outlet mounted in the hull side dumps the water out of the hull.

Mike used hot water pipe insulation tubing and foam as flotation. Fiberglass boats will sink as the glass is heavier than water. If you don't put enough flotation in your fiberglass hull, it can sink and be lost.

Hardened fuel-proof paint was used to dress up the hull. Bright colors not only look good, but they make the hull easier to see. Flat, dark colors camouflage the boat and make it hard to see when it is dead in the water.

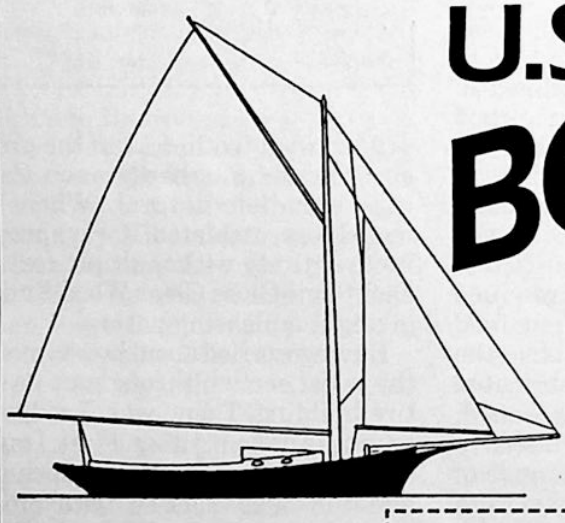
Sharpen the leading edges of the rudder and turn fin to reduce drag. OPS provides a tuned pipe with each engine. Keep the tuned pipe in place with a firm bracket bolted to the strudder.

Mike Fisher is justifiably proud of his new Magnum deep vee. Not only is it an excellent sport boat, but when we are running together, it displays good racing ability. Not bad for a first boat.

If you are looking for a good first boat or a solid rough water sport hull, Give Andy a call. If you are thinking about setting up a racing deep vee or endurance hull, give Andy a call. AC Magnum hulls are manufactured in Canada and Andy can tell you where you can get one of his boats.

As a quick follow up, I went skiing in British Columbia during February, 1991. On the drive home, I stopped by Andy's store in Kelowna. He is now marketing a very competitive catamaran and has finished testing and making the molds for a fantastic looking sport 40 hull and a 7.5cc/11cc outboard tunnel hull.

He showed me the first few hulls out of the molds and both the three-point hydroplane and tunnel hull feature light, strong construction. Give Andy a telephone call at (604) 765-7730, or write him at Okanagan Speedway and Hobby, #301 Highway 30 West, Kelowna, British Columbia, Canada. •



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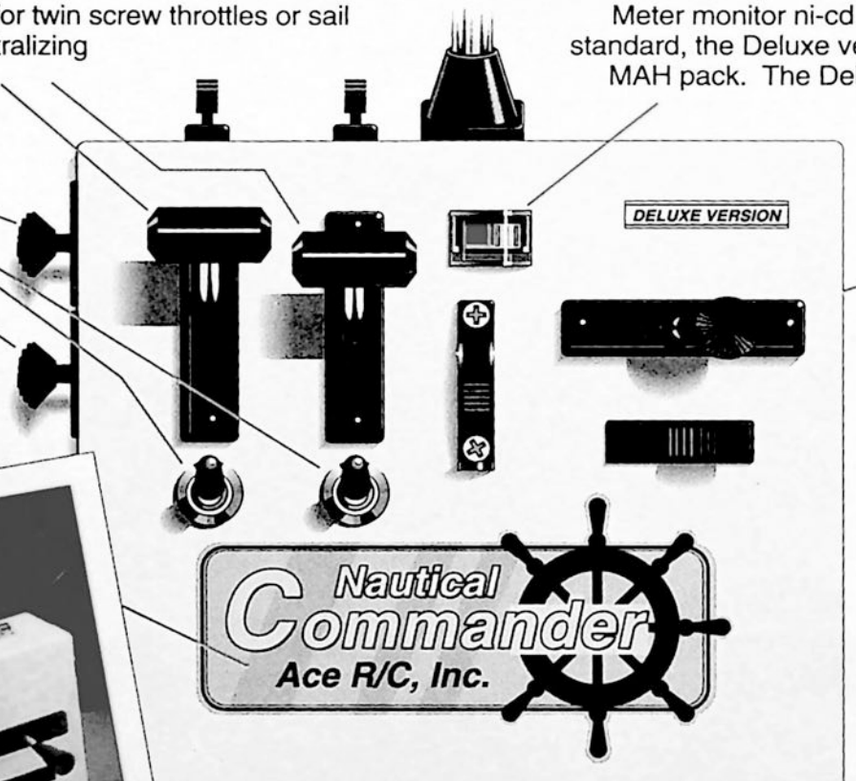

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